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THE HUNGARIAN DAISY AS AN ADULTERANT OF INSECT POWDER.

By G. M. Beringer, A. M., Ph.G.

Read at the Pharmaceutical Meeting, December 18th.

A short time ago, there was received in New York a consignment, consisting of a number of bales of these Hungarian Daisies. They were entered at the Custom House as insect flowers and were evidently intended as a sophistication of the Dalmatian Insect Powder. In the course of business, a sample of these flowers was submitted to the writer.

The similarity in size and general appearance to the flowers of the Dalmatian powder, would easily deceive the careless or unguarded observer. On close inspection, however, with a microscope of ordinary powers, the differences in the botanical structure are such as to render the distinction between the whole flowers comparatively easy. But as they will, probably, in future importations, be mixed with the genuine, which, usually, as imported in bales, are very much broken up, they will prove a dangerous adulterant, one difficult to determine, and if in the powdered article most likely beyond detection.

The Dalmatian Insect Powder has proven so superior to the Persian powder, that it has driven the latter almost entirely out of the market. It is said to be the most valuable product of Dalmatia and is now imported in very large quantities. As imported, it is usually adulterated with the ground stems and leaves of the plant. The latter being cut down at the end of the season, dried, ground and mixed with the ground flowers in the proportion of one to three or four of the flowers. This accounts for the fact, that the whole flowers are

usually quoted at the same price and frequently at an advance on the price of the powder. The adulteration of this product with Hungarian Daisy, is deemed of such importance as to be worthy of record and prompt exposure.

The present editions of the Dispensatories contain but indifferent descriptions of this drug. The following descriptions are offered with the hope that they may serve to distinguish the two.

Hungarian Daisy.—Stems angled, the dried flower heads averaging about half inch in diameter, the rays florets being twisted and folded. When soaked in water to their natural size, the flower heads average 1¼ inch in diameter from tip to tip of the ray florets. The involucre broadly campanulate imbricate, the scaly margins chaff-like, the stem being deeply inserted makes it distinctly depressed or concave; greenish-grey in color, glabrous. (Fig. 1 represents the involucre, the dried flower enlarged two diameters.)

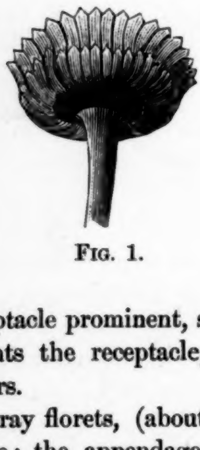

FIG. 1.

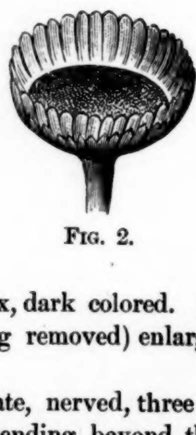

FIG. 2.

Receptacle prominent, subglobular, convex, dark colored. (Fig. 2. represents the receptacle, (the florets being removed) enlarged two diameters.

The ray florets, (about 18), white ligulate, nerved, three toothed pistillate; the appendages of the style extending beyond the tube. The achenia angled without pappus, but crowned with a faint margin. (Fig. 3 A represents the ray floret enlarged about three diameters.) The disk florets numerous, bright orange yellow, tubular, five toothed, the stamens included; achenia without pappus. (Fig. 3 B represents the disk floret enlarged about seven diameters.)

The botanical characteristics of this flower would indicate that it most probably belongs to the sub-genus Leucanthemum; but, with only the flowers for examination, the naming of the species would be but a guess of little or no value.

Chrysanthemum cinerariæfolium, *Bocc.* (Pyrethrum cinerariæfolium, *Treviranus*)—*Dalmatian Insect Flower.* Stem angled, the whole flower head ashy gray in color and quite pubescent. When dried the flower heads are from $\frac{1}{4}$ to $\frac{3}{8}$ inch in diameter, the ray florets being twisted and folded and frequently broken off. When soaked to the natural size, about $1\frac{1}{4}$ inch in diameter, including the ray florets. The involucre imbricate,

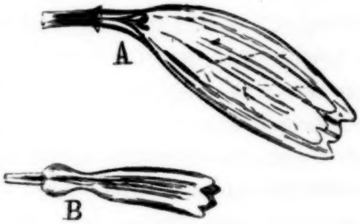

FIG. 3.

FIG. 4.

the scaly margins membranous, campanulate and convex without depression at place of attachment to stem. Fig. 4 represents the dried involucre enlarged two diameters. The receptacle small, conical, naked and solid and light greenish-gray in color. (Fig. 5 represents the receptacle of the dried flower, the florets being removed, enlarged two diameters.) The ray florets, (about 18) white, ligulate, nerved, three toothed, the tube pubescent, pistillate; the appendages of the style

FIG. 5.

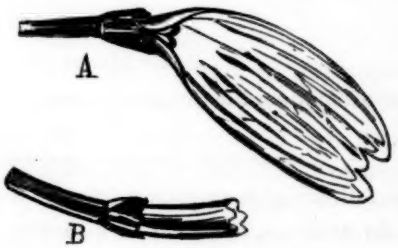

FIG. 6.

protruding beyond the short tube. The achenia crowned with a membranous, notched (eroded) pappus. (Fig. 6 A represents the ray floret enlarged about 3 diameters). The disk florets, numerous gray tending towards light yellow in color, tubular, five toothed, the stamens included. The achenia angled, nearly as long as the tube and also crowned with a notched pappus. (Fig. 6 B represents the disk floret

enlarged about four diameters.) The florets of the true insect powder are somewhat larger than those of the Hungarian Daisy.

The Hungarian Daisy is distinguished from the true Pyrethrum by the orange yellow disk florets, by the depression of the involucre, by its prominent dark receptacle and the absence of pubescence and pappus. The odor is less pungent than that of the true insect flower being more like that of matricaria. The difference in odor is more pronounced on infusing in warm water. The Hungarian Daisy yields a powder, somewhat darker in color. This powder used upon flies and cockroaches appeared to have no value as an insecticide. Microscopically no difference could be detected between the two powders.

Time and the amount of material at my command would not permit of a thorough chemical examination, but it was hoped that the percentage of extractive matter obtained with various solvents might furnish a useful comparison. The following statement exhibits the results obtained.

	Chrysanthemum cinerariæfolium.	Hungarian Daisy.
Petroleum Ether,	2·49 per cent.	3·37 per cent.
Ether,	2·85 "	2·68 "
Alcohol,	6·57 "	9.45 "
Water,	16·70 "	13·43 "
Ash,	6·50 "	9·30 "

SOME INDIAN FOOD PLANTS.

II. LEWISIA REDIVIVA, *Pursh.*

By Henry Trimble.

A Contribution from the Chemical Laboratory of the Philadelphia College of Pharmacy.

Read at the Pharmaceutical Meeting, December 18th.

The following description of the above plant, together with the material for analysis, has been furnished by Dr. V. Havard, U. S. Army Surgeon, at Fort Abraham Lincoln, Dakota:

"Lewisia rediviva, called "Spathum" by the natives of Northern California and South Oregon, and "Chita" by those of Northern Oregon. The "bitter root" of the whites in the Rocky Mountain region.

"This interesting member of the Purslane family (Portulacaceæ) named after the great explorer, Capt. Lewis, who, with Capt. Clarke, first crossed the Rocky Mountains in 1805, owes its specific designa-

tion to its wonderful vitality; prepared specimens have been found, after months and years, sprouting in herbariums, and have, even then, been planted successfully.

"It is a small stemless herb with linear leaves, smooth and fleshy, densely imbricated on the short, thick caudex. From the cluster of leaves spring one or more jointed scapes, one or two inches long, each bearing a showy flower. Sepals 6–8, light pink, broadly ovate, membranous, persistent. Petals 8–10, rose colored, oblong, often an inch long, at length twisting around the stamens and pistil. Stamens numerous. Capsule globose, 1-celled, separating transversely at the base, containing many campylotropous shining seeds borne on long funiculi which spring from a central placenta.

"This plant blossoms early in May and through June and part of July. After the middle of July (according to Dr. C. C. Parry) the scape breaks off at the joint and the flower is blown away, leaving no trace of the plant exposed to view until the following spring develops the cluster of leaves by which the Indians are guided in procuring their supplies of this palatable and nutritious root.

"It is common, often abundant in the Rocky mountains and westward to the Pacific, on dry prairies and in mountain valleys. Its vast habitat comprises the southern part of Washington territory, Oregon, Idaho, Western Montana (where it gives its name to the Bitter Root Mountains), Northern California, Nevada, Utah, Western Wyoming and Northern Arizona.

"The natives use the roots as an article of food. These roots, 3 or 4, or more, curled and twisted, spread out laterally and are generally superficial. As they spring from the caudex they are rarely half an inch in diameter and are seldom thicker than a goose quill; they taper gradually to a length of two to four inches when they branch off into small radicles. The bark is brownish externally, bright red within and very bitter, it is quite possible that it might possess useful tonic and astringent properties. The inner part of the root is white and farinaceous, containing in the centre the yellowish pith. This white part is quite palatable and said to be very nutritious, a single ounce of the dried article (according to Dr. E. Palmer) being sufficient for a meal. Eaten raw it has a slight bitterish flavor. According to Nuttall, it almost dissolves into starch by maceration in cold water. If boiled in water, it forms a substance similar to boiled arrow-root. The Indians, generally, boil it with other esculents into a soup.

"As a very pretty ornamental plant, the Bitter Root would prove quite an acquisition to our gardens."

The roots of the above plant as received by me were free from bark, of a white color, and ready for use as food. No evidence of sugar as glucose or saccharose could be obtained. Tests for tannin likewise gave negative results. The most important constituents are starch, gum and mucilage, the last two are not readily precipitated by alcohol. The following summary gives the amount of the most important food constituents.

Fat, resin and wax	4·98
Gum and mucilage	14·80
Albumenoids	3·58
Starch	8·57
Moisture	12·17
Ash	2·53
Woody fibre and undetermined	53·37
	100·00

The amount of starch found may appear small when we consider the uses of the root, but the large amount of gum and mucilage make up for this deficiency.

THE LEAVES OF MAGNOLIA GLAUCA, LINNÉ.

By Wilbur Fisk Rawlins, Ph. G.

Abstract from a Thesis.

The leaves are three to six inches long, one and a half to two inches in width, have a prominent mid-rib, are pinnately veined, elliptical, petiolate, coriaceous, deep green upon the upper side and of a beautiful glaucous color underneath. Twenty pounds were collected in the early part of September. After drying they weighed eight pounds, the loss being sixty per cent. They were then reduced to a number eighty powder.

Two grams of the drug heated in an air-bath at a temperature of 110° C. lost ten per cent., and when incinerated left 10 per cent. of ash.

Fifty grams of the powdered leaves were placed in a flask, covered with petroleum spirit and, after maceration, exhausted; five per cent. of the drug was soluble in petroleum. This residue when heated to 110° C. lost four-tenths per cent. Absolute alcohol left four-tenths of one per cent. of insoluble waxy matter melting at 64° C.

The drug was then treated with stronger ether, which dissolved four per cent. The dry extract was treated with boiling distilled water and lost three-tenths of one per cent. It gave a bitter taste to the water, but yielded no precipitate to tests for alkaloids. On evaporating the ether there were formed some fine needle-shaped crystals. The extract was dissolved in alcohol, the chlorophyll removed by animal charcoal, and several attempts were made to obtain the crystals in a purer state, but without success. There was, however, a resin present that had a tendency to crystallize.

Absolute alcohol was the next menstruum used, and the extract obtained was five per cent. of the drug. About one and a half per cent. was soluble in water. The portion that did not dissolve in water was a greenish-yellow powder and had a lasting unpleasant taste. Tannin was found in the soluble portion, but the percentage was not determined. The aqueous solution was made acid and agitated successively with petroleum, benzol and chloroform. It was then made alkaline and the same treatment repeated. The resulting liquids were evaporated, but nothing found in the petroleum or benzol. There was a deposit of crystals, however, from both the acid and alkaline liquid with chloroform. Nothing else of importance was found in the alcoholic extract.

The residue, after exhaustion with alcohol, was macerated with water, which dissolved thirteen per cent. of the drug, containing mucilage, coloring matter and ash, but no sugar, nor anything else of special importance.

The residue insoluble in water yielded to solution of caustic soda mucilaginous substances and albuminoids amounting to four per cent.

Diluted hydrochloric acid dissolved two per cent. of the drug, and of this six-tenths of one per cent. was oxalate of calcium. No starch was found.

On treatment with chlorine water the loss was six per cent. lignin; and with chlorate of potassium and nitric acid the loss was two per cent.

Three pounds of the fresh drug were distilled with water. From the distillate, by shaking with ether, was obtained a volatile oil of a bright green color with a penetrating odor, resembling that of fennel or anise, but more pleasant. The yield was very small, about one drachm being obtained from the three pounds. While the solution of

oil in the ether was filtering the rapid evaporation of the ether caused crystals to form on the edge of the filter, but they soon volatilized and no examination was made of them.

In order to determine the nature of the crystals formed by the use of chloroform from the aqueous solution of the alcoholic extract, one pound of the original drug was packed in a percolator and exhausted with wood alcohol; the alcohol was recovered by distillation and distilled water added to the residue; the solution was filtered and agitated with chloroform, but crystals were not obtained. These extracts had a bitter taste, imparted fluorescence to the chloroform solution and after boiling with acid, reduced Fehling's solution. The principle seems to differ from the magnolin of Mr. Procter.

NOTE BY THE EDITOR.—It does not appear to be generally known that the fresh leaves of Magnolia glauca may be used in the place of indelible ink for the marking of linen and other fabrics, by placing upon the latter the lower surface of a leaf, and tracing upon the upper surface with a blunt peg, using some pressure, the desired characters. The writing appears upon the fabric at first of a grayish green color, which gradually becomes darker, and does not disappear on washing.

METHYSTICIN FROM PIPER METHYSTICUM.

BY ROBERT GLENK.

On evaporating an alcoholic tincture of the root to a small bulk, a crystalline precipitate forms, which is obtained snow-white on dissolving in boiling water (to separate resin) and allowing to cool. This principle is the methysticin first observed by Morton, in 1844, and further examined, in 1860, by Cuzent, Gobley and O'Rorke. Crystallized from alcohol, it forms fine needles, which are odorless and tasteless, and freely soluble in ether, benzol and benzin; very soluble in boiling alcohol, slightly soluble in the cold; soluble in about 60 parts of boiling water, but sparingly soluble in the cold, separating as a crystalline feathery precipitate. Its solution in hot water is of a neutral reaction, and is not precipitated by alkaloidal reagents.

When placed in a test tube kept in mercury, the principle melts at 133°C; by heating on platinum foil it burns with a smoky flame, and is finally consumed without residue. It does not reduce an alkaline solution of copper.

Concentrated sulphuric acid forms immediately an intense carmine

color, which changes to a brown in one or two hours. Concentrated nitric acid dissolves it with a reddish-brown color. Concentrated hydrochloric acid gives an orange red color.

With oxidizing agents, like permanganate of potassium, chromic acid ($K_2Cr_2O_7+H_2SO_4$), or nitric acid, it is decomposed, with the production of a strong heliotropin-like odor, which is quite characteristic, being produced even in very dilute solutions. A cold solution of methysticin in diluted alcohol, on being boiled for a few seconds with dilute nitric acid, gives a decided odor of heliotrope. This does not occur with other oxidizing agents in such dilute solutions.

The color, with concentrated sulphuric acid, is also quite characteristic, a bright carmine red being produced, in rather dilute solutions, on adding to four or five drops of the latter about ten drops of the acid.

ANALYTICAL NOTES.

Abstracts from Theses.

Gallic acid.—Specimens of gallic acid from different manufacturers were procured by Fred. Wm. Meissner, Jr., Ph. G., and subjected to the pharmacopœial tests. The saturated aqueous solutions yielded no precipitates with an alkaloidal salt, albumen or gelatinized starch, but produced heavy white precipitates with a solution of tartar emetic and ammonium chloride. Even in very dilute solutions of gallic acid a distinct precipitate was obtained by this test, and previous continued washing with cold water did not prevent the precipitation. Gallic acid was then prepared by Liebig's process from tannin by boiling with sulphuric acid, recrystallizing and decolorizing with animal charcoal, remaining traces of tannin being removed by solution of lead acetate, as suggested by Watt. The crystals thus obtained answered all the pharmacopœial requirements; the result may, perhaps, have been caused by the presence of a slight amount of acetic acid. The albumen and alkaloid tests are regarded as sufficiently delicate for the detection of tannin in gallic acid, one part in thirty being easily indicated.

Five samples of gallic acid on being heated to 100° C. lost respectively 9·5, 9·6 9·75, 9·75 and 10·5 per cent. of water.

Granular salts of caffeine.—William Kuder, Ph. G., procured a sample of crystallized citrate of caffeine, which was of neutral reaction, and volatilized completely when heated on platinum foil. A so-

lution of 0·50 gm. of this sample in distilled water was made alkaline with sodium hydrate, repeatedly agitated with chloroform, the chloroform solution evaporated spontaneously, and the crystals thoroughly dried; the weight of caffeine was 0·427 gm., corresponding to 0·466 gm. of crystallized alkaloid. Citric acid was absent.

Some of the commercial granular effervescing salts were examined in the same manner, except that one or two gm. was used for each assay, which gave for—

I.	1·9	per ct. dry alkaloid,	corresponding to	2·061	per ct.	crystallized alkaloid
II.	4·84	" "	"	5·28	"	"
III.	1·5	" "	"	1·628	"	"

Nos. I. and II. were granular citrates; No. III. contained bromides.

Assays of Milk.—The standard for pure milk, adopted in different localities, is given by Albert James Lynch, Ph. G., as follows:

	France.	England.	N. York.	N. Jersey.	Mass.
Fat	2·70	2·50	3·0	3·0	3·65
Other solids	8·80	9·0	9·0	9·0	9·35
Total solids	11·50	11·50	12·0	12·0	13·00

During the winter of 1887–88, the author examined a number of samples of milk procured in the Philadelphia market, with the following results:

	I.	II.	III.	IV.	V.	VI.	VII.	VIII.
Fat	5·21	3·63	2·61	2·70	3·51	2.65	5·04	3·75
Other solids	15·60	9·26	9·01	9·22	9·08	9·18	10·46	9·21
Total solids	20·81	12·89	11·62	11.92	12·59	11·88	15·50	12·96

No. I. was Alderney milk; the solids consisted of fat 5·21, sugar 4·20, casein and albumen 5·69, ash 0·71. No. VII. was also sold as Alderney milk.

An analysis of a so-called catarrh cure was made by Otto Prochaska, Ph. G. One of the powders was white, the other of a pink color; the coloring matter was not taken up by alcohol, but was dissolved by ammonia, with an intense red color, which was destroyed by hydrochloric acid. In other respects the two powders showed no difference. They had an alkaline reaction, on ignition lost 28 per cent. without charring, yielded nothing to ether or chloroform, and in aqueous solution, to which ammonium chloride had been added, gave, with ammonium sul-

phide, a slight black precipitate, and the filtrate a slight white precipitate with ammonium phosphate. Sodium was the remaining base found, and besides carbonic, no other acid could be detected. The powders consist of commercial sodium bicarbonate, one of them being colored with a little carmine.

An analysis of a so-called invisible toilet powder was made by Owen C. Spear, Ph. G. Ether dissolved the volatile oil, and on evaporation left a trifling amount of fatty matter. When ignited the odor of burning sugar was given off. Cold water took up nothing; on boiling with water and cooling a gelatinous liquid was formed, which turned blue with iodine. After exhausting with boiling water, the residuary powder did not blacken when ignited; hydrochloric acid dissolved a portion of this residue, containing Zn and a little Fe, Al and Ca, but no other metals. The undissolved powder was ignited with Na_2CO_3, then treated with water and HCl, when the presence of silica and magnesia, with traces of Fe and Al was shown. The toilet powder proved to be a mixture of starch, talc, zinc oxide and calcium carbonate.

For quantative analysis the powder was ignited and the starch estimated by the loss. Treatment of the residue with HCl left the talc undissolved; the solution treated with ammonia yielded a precipitate, which after ignition was weighed as Fe_2O_3 and Al_2O_3. From the ammoniacal filtrate the zinc was precipitated by NH_4HS, converted into chloride, precipitated as carbonate, and weighed as oxide. The lime was precipitated from the mother liquor, and weighed as carbonate. The analytical results were:

Starch	18·02
Talc	49·42
Alumina and ferric oxide	1·37
Zinc oxide	29·76
Calcium carbonate	1·43
	100·00

The toilet powder was probably made by mixing together commercial starch 18, talc 52, and zinc oxide 30 parts.

To remove hiccough, Dr. Böttrich (*Therap. Monatsh.*, June, 1888,) has found the best proceeding, to take a very deep inspiration and hold the breath as long as possible. If the breath be kept just past a rising singultus, the latter generally ceases.

ANALYSIS OF MARKET JELLIES.

By Lysander Mann Jones, Ph. G.

From an Inaugural Essay.

It has been asserted that the jellies found in the market are not pure fruit jellies as represented and that they are principally composed of gelatin and glycerin. Although my analysis has proved that they are fruit jellies, at least some of them are not made from the fruit which they are supposed to represent, but are made from some cheaper fruit artificially colored and flavored.

Taking as a standard a currant jelly known to be pure and homemade, I have analyzed six different jellies purchased in the market, namely: apple, currant, cranberry, grape, pineapple and raspberry and compared these with the genuine. Of these I found the grape to be the only genuine and made from the fruit represented. The commercial ones differ considerably in color and taste from the genuine; the genuine being of a deep red color and having a very pleasant, sweet, fruity and acidulous taste while the commercial present a much nicer appearance being of a bright red color and more transparent, but have a flat, ropy and but slightly acidulous taste and are not as soluble.

The standard jelly was composed of 26 per cent. water, 36.5 per cent. glucose, 32.5 per cent. saccharose and 1.3 per cent. pectin. The remaining 3.7 per cent. consists of insoluble matter, malic and tartaric acids. The pectin was gotten by adding alcohol to a given weight of jelly in a concentrated aqueous solution, collecting the precipitate on a filter, drying and weighing. The ash of 2 grams amounted to 5 milligrams or .25 per cent.

The commercial currant jelly I found to be composed of 45 per cent. water, 18.46 per cent. glucose, 13.84 per cent. saccharose and .7 pectin. The remaining 22 per cent. consists of insoluble matter, tartaric acid, artificial coloring matter, etc. The ash of 5 grams amounted to 17 milligrams, or .34 per cent.

The genuine had a strong acid reaction, while the commercial jellies had but a faint acid reaction with the exception of the grape.

On evaporating an aqueous solution of the market jellies an odor was given off resembling baked apples, thus proving the source from which they are made. The absence of gelatin was proven by no precipitate forming on the addition of tannin, while the presence of pectin

as the base was proven by means of a solution of sub-acetate of lead.

The principal adulterant found in the market jellies, except in the the grape, was the artificial coloring. On making an aqueous solution of about 5 grams, evaporating this to the consistency of a syrup and to this adding about 100 cc. of alcohol and warming slightly, the pectin would be precipitated and the coloring matter taken up in the alcohol. This was filtered and to the filtrate was added small pieces of raw silk and wool and boiled for some fifteen minutes. The result was the silk and wool took up the coloring and were dyed of a light red color. The coloring in the genuine would not act in this way.

In testing the genuine jelly for pectin with solution of sub-acetate of lead, the coloring matter was precipitated with the pectin, while in the commercial jellies it remained in the solution, the pectin being separated as a light flesh colored precipitate.

The market jellies in solution did not present a perfectly clear liquid, but on the addition of ammonia water the color deepened considerably and the solution became much clearer.

Glycerin was not present in the jellies. This was shown by precipitating the pectin with alcohol, filtering, evaporating nearly to dryness, treating this residue with one part ether and two parts alcohol, filtering, evaporating to dryness and testing this with the borax bead. Metals were absent with the exception of a little iron.

EXAMINATION OF CHLORINATED LIME.

By Hermann M. Schrœter, Ph. G.

A Contribution from Chemical Laboratory of the Philadelphia College of Pharmacy.

Read at the Pharmaceutical Meeting, December 18th.

Chlorinated lime as a commercial product is variable in composition. It is therefore valued by the percentage of available chlorine which it contains. The Pharmacopœia requires at least 25 per cent. of such available chlorine. The following examination of this article will show the average value of same as found in the market, both in bulk and in packages. That in ready put-up packages is generally contained in pasteboard boxes, the insides of which are coated with resin, or else in sealed tin cases. Small and large packages were procured, as also several samples in bulk, of which 18 kinds were examined. The method used was that recommended by the Pharmacopœia or the

modification of Bunsen's iodometric method. It consists in determining volumetrically by titration with sodium thio-sulphate, the amount of iodine which is liberated in an aqueous solution of chlorinated lime when potassium iodide and hydrochloric acid are added in excess. The Pharmacopœia directs 0·71 gm. of chlorinated lime mixed with a solution of 1·25 gms. of potassium iodide in water and 9 gms. of dilute hydrochloric acid added, should require not less than 50 cc. of the volumetric solution of sodium hyposulphite. This corresponds to 24·93 per cent. of chlorine. The following figures give the mean percentages of chlorine of several determinations of each sample:

1.	25·73	per cent.	7.	31·11	per cent.	13.	29·17	per cent.
2.	37·	"	8.	25·73	"	14.	31·16	"
3.	35·75	"	9.	25·83	"	15.	30·76	"
4.	31·91	"	10.	22·63	"	16.	30·91	"
5.	24·33	"	11.	24·53	"	17.	27·92	"
6.	37·84	"	12.	28·17	"	18.	36·46	"

Nos. 1, 2, 3, 4, 14, 15, 16 and 17 were obtained in bulk. Nos. 6 and 12 were 1℔ packages and the balance were smaller parcels. The above figures give an average percentage of 29·83 per cent. of chlorine, showing the superior strength of the commercial article. From 1℔. packages determinations were made severally from different parts of the parcels, the difference in results being only slight.

PERMANENT SYRUP OF HYDRIODIC ACID.

By Joseph W. England, Ph. G.

Read before the Pharmaceutical Meeting, December 18th.

Hydriodic acid as a remedial agent first came into vogue some thirty years ago through Dr. Buchanan, who strongly urged its use as an alterative. Since its introduction it has found a limited and varying demand amongst the medical profession.

There seems to be good grounds for believing that its failure to meet popular favor may have largely been due to the fact that the solution is exceedingly unstable, unless well protected by sugar and kept in close-stoppered vials. Even then it has been a most unsatisfactory preparation, pharmaceutically, tending readily to decomposition, on exposure to air, into free iodine and water, the former of which, by its presence, rendered it a local irritant instead of an alterative.

Of late, however, there seems to be a tendency to return to its use,

especially as there are now obtainable in the markets a number of syrups of hydriodic acid claimed to be unalterable on exposure to air.

Various preservative substances are used to achieve this end, such as honey, potassium hypophosphite and hypophosphorous acid; glycerin has little or no influence in retarding decomposition.

The new National Formulary (p. 122) gives a formula for the preparation of a colorless hydriodic acid syrup, prepared by double decomposition between potassium iodide and tartaric acid in the original way, but preserving it from oxidation with potassium hypo-phosphite.

This formula, in its practical workings, is most excellent and, in the writer's opinion, superior to the pharmacopœial process of iodine and sulphuretted hydrogen. There is one point in it, however, upon which criticism might be turned and that is the presence of the potassium hypophosphite, or, what is more probable, hypophosphorous acid, since some acid tartrate of potassium still remains in the finished solution unprecipitated, but the quantity of this salt used, is so small that this feature, practically, need not be regarded.

The writer has used this formula since last August, with but one modification in detail, and that was the substitution of syrupy glucose for potassium hypophosphite, as the preservative. A sample of some made last August is as clear and destitute of free iodine as some made yesterday. The modified formula is as follows:

Iodide of Potassium	123	grains.
Tartaric Acid	112	"
Water	½	fluidounce.
Diluted Alcohol	1	"
Syrupy Glucose	¼	"
Syrup, enough to make	16	"

Dissolve the iodide of potassium in one-half (½) fluidounce of water and the tartaric acid in one-half fluidounce of diluted alcohol. Mix the two solutions in a vial, cork and shake it well, and then place it in ice-water for about half an hour; again shake it thoroughly, and then pour the mixture upon a small white filter, and filter into a bottle containing 13¾ fluidounces of syrup and one-fourth (¼) fluidounce of syrupy glucose. When the liquid has run through, wash the vial and filter with one-half (½) fluidounce of diluted alcohol, added in several portions. Then add enough syrup to make sixteen (16) fluidounces.

The product is a clear, transparent, almost colorless liquid, odorless,

having a pleasant acidulous taste, and evincing no free iodine, on the addition ot cold gelatinized starch. It remains unchanged on exposure to air. Syrupy glucose is used in place of the solid compound, because it is more convenient and fulfils the same purpose. One peculiarity noticeable with its use is the fact that syrups of hydriodic acid made with it, and containing, at first, free iodine, from faulty manipulation, become, on standing for a day or two, colorless from the conversion of the free iodine, by the glucose, into hydriodic acid.

ABSTRACTS FROM THE FRENCH JOURNALS.

Translated for the American Journal of Pharmacy.

Rhamnus Frangula in Odontalgia.—Dr. Gretchinsky writes to the *Revista de Med. y Farm.*, that he makes a decoction by boiling 15 to 30 gm. of the bark in 2 tumblers of water. Patients are directed to rinse the mouth with this every five minutes until the pain ceases; and then every two hours. Cavities may be filled with cotton dipped in the tincture.—*Répert. de Ph.*, November.

Papayotin in Fissure of the Tongue.—Schwimmer is said to have used this substance successfully in cases which had resisted the action of chromic acid, iodoform and nitrate of silver. He employed the following formula: Papayotin, 1 to 2 parts; glycerin and distilled water, of each 10 parts. Five or six applications should be made daily, after drying the fissures.

Benzoinated Gray Oil.—Beausse places 20 gm. of mercury in a matrass and adds 5 or 6 gm. of ethereal tincture of benzoin, with brisk agitation. When the globules are no longer visible the tincture is decanted and the vessel re-corked and again agitated. The mercury forms a soft paste on the sides of the vessel. All the material is then put in a mortar with 10 gm. of vaselin and 30 of liquid vaselin and well triturated, adding also the washings of the matrass with ether. "The preparation requires a labor of four or five hours."—*Arch. de Ph.*, Nov. 5.

Naphthol Ointment.—Used for skin diseases, this ointment should contain, according to Dr. Lassar, about 10 per cent. of naphthol, to which—in obstinate cases—10 per cent. of camphor may be added. The naphthol ointment may remain in contact with the skin

from one-half to one hour; the camphorated compound must be removed within about 15 minutes.—*Arch. Méd. Belg.; Monit. Th.*, Nov. 5.

Preparations of Sozoiodol.—A 5 to 10 per cent. solution retards the development of pyogenous cocci; 10 per cent. solutions prevent the development of microbes; 20 per cent. solutions render gelatin sterile. In doses of 1 gm. sozoiodol is not toxic to rabbits. For open wounds, 2 or 3 per cent. solutions of the acid (diiodoparaphenolsulphonic) with the salts of sodium or aluminium is used. For a prolonged action the sozoiodol of potassium is mixed dry with powdered talc or milk sugar in quantities of 5 to 10 per cent. For ointments, sozoiodol of potassium, sodium, aluminium or lead may be used in the proportions of 5 to 10 per cent., with lanolin. For insufflations, the sodic or potassic salt is mixed with sugar of milk. The same is true of the zinc salt which may contain 1 to 10 per cent.; and the mercury salt, which should be made with 5 to 10 of the latter to 90 or 95 of sugar of milk.—*Nouv. Rem.*, Nov. 24.

Unna's Topical Applications in Skin Diseases.—Dr. Hallopeau in a recent visit to Unna, learned that he has been engaged in perfecting these applications, which are recommended in three forms: medicated paste; ointments spread upon muslin, and plasters similarly prepared. The paste, used as a vehicle, prolongs the action of the medicaments, retains the secreted water upon the surface of the skin, augments cutaneous respiration and quiets irritation. The applications are intended for prolonged use without re-dressing. The *soft paste* of Unna is made as follows: Oxide of zinc, 15; glycerin, 15; gelatin, 25; water, 25. The muslin plasters are prepared by making the fabric impermeable with caoutchouc dissolved in benzol or the oleate of aluminium. M. Vigier in recent experiments on the preparation of the plasters gives the preference to a coating of soft paraffin mixed with gutta-percha dissolved in bisulphide of carbon. Unna's paste, spread on these plasters, or used as an ointment, is said to "render great service in the treatment of pruritus, eczema, intertrigo and acné."—R. Blondel, *J. de Ph. et de Ch.*, Dec. 1.

Vermillonette.—In an aqueous solution of eosine, minium is placed in suspension and briskly agitated, while adding a solution of acetate or nitrate of lead until the color is wholly precipitated. Wash, press and bolt. The color is very brilliant, but, like all eosine colors,

it fades under the influence of light.—*Monit. sci.*; *J. de Ph. et de Ch.*, Nov. 1.

TOXIC POWER OF STROPHANTIN. Prof. Sée in a communication to the Academy of Medicine (Nov. 13), said that the strophantus plant or its extracts only, should be used in medicine; strophantin, he said, had so high a toxicity that it "must not be employed clinically." At the same meeting, Dr. Dujardin-Beaumetz also recommended that strophantin be prescribed in no case, "as the quantity of strophantidin contained in it must, for the present, be more or less conjectural." [The samples of strophantin which seem to have frightened the Paris faculty are said (*Un. Méd.*, Nov. 15), to have been made by M. Arnaud, chief of M. Chevreul's laboratory.]

INCOMPATIBILITY OF COCAINE AND BORATE OF SODIUM. In a paper to the *Société de Pharmacie*, M. Levaillant said that in mixing these substances for collyria or gargarisma he had found a precipitate of cocaine. This will disappear on the addition of a few drops of glycerin. *Arch. de Ph.*, Nov. 5.

REACTION OF PHENACETINE.—Chlorinated water gives the aqueous solution a red-violet color which soon passes to ruby red. A solution of chloride of lime will give the same reaction.—*Arch. de Ph.* Dec. 5.

ESCHSCHOLTZIA CALIFORNICA.—According to a recent examination of this plant by M. Bardet, (*J. de Ph. et de Ch.*, Dec. 1), its narcotic power is weak; doses of 10 to 12 gm. of the extract were necessary to kill a rabbit. In seeking the active principle, the author took up the extract with acidulated water and treated it with ammonia, which gave a viscous product capable of reducing iodic acid, a violet precipitate with molybdate of sodium, and an orange color with nitric acid; briefly, it offered the reactions of morphine. This is the first time, so he believes, that morphine has been obtained from plants other than papaver[1]. After extracting the morphine, another substance remained which gave a yellow precipitate with phospho-molybdate. It appeared to be a glucoside. M. Bardet is now studying it.

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[1] That Walz found in Eschscholtzia in 1844 sanguinarine and two other alkaloids was mentioned in *Amer. Journ. Phar.*, 1887, p. 296. Charbonnier obtained a little morphine from the leaves and capsules of Argemone mexicana in 1868; see *Jour. de Phar. et de Chim.*, 4 ser., vii, p. 348–358.—EDITOR OF AMER. JOUR. PHAR.

Reactions of Certain Alkaloids with Fluoniobate of Potassium and Chlorine in Sulphuric Acid.—The fluoniobate reagent is prepared by dissolving 1 gm. of the salt in 40 ccm. of concentrated sulphuric acid, and then heating to drive off the hydrofluoric acid. With apomorphine, this solution gives a very intense red, slightly brownish, which becomes of an ochre yellow color on adding water. Morphine acts in the same manner, but the coloration is weaker. The chlorine reagent is easily prepared by saturating concentrated sulphuric with pure, dry chlorine. With this, narcotine gives a very beautiful violet coloration, which passes rapidly to wine-red and yellow; heated slightly, the mixture becomes red. Narceine turns of an olive green color which turns gradually blue, with streaks of red. Brucine takes a red color, as with nitric acid.—*A. I. Brociner, in J. de Ph. et de Ch.; Union Ph.*, October.

Action of Hypobromite of Sodium upon Certain Aromatic Derivatives; and Differential Reaction Between Hippuric and Benzoic Acids.—If hypobromite of sodium containing an excess of alkali be boiled with hippuric acid, gaseous bullæ are disengaged and the liquid clouds with a reddish-yellow tint. The precipitate, which goes down on cooling, appears as a powder of a kermes-red color. Benzoic acid under like conditions gives no reaction. Glycocol causes a decoloration of the hypobromite, with a disengagement of azotic gas. Testing the action of hypobromite of sodium upon a large number of azotized products of the aromatic series, the following results were obtained: *Benzamide* and *Benzonitril* gave nothing when cold; on ebullition, gave a kermes-red precipitate. *Aniline;* the aqueos solution—even when largely diluted—gave an orange precipitate; the reaction was nearly as sensitive as that of the hypochlorite of lime. *Methylaniline;* a yellow precipitate slightly greenish when cold, but becoming red on boiling. *Toluidine;* same results as for aniline; the precipitate is browner. *Anilides;* nothing with cold; on boiling, a reddish precipitate. An odor of cyanide of methyl is disengaged. *Hydrochlorate of diamine-metaphenylene, diamido-benzoic acid, diamine-toluilene;* all gave—hot or cold—a red maroon precipitate. *Ferrocyanides, ferricyanides, nitro-prussiates;* on boiling, all gave a red precipitate of ferric hydrate. *Pyridine;* no reaction. *Quinoleine;* does not give the orange-red precipitate except—which is frequently the case—aniline is present.—*Acad. des Sci.*, cvii, 662, 1888; *J. de Phar. et de Chim.*, Dec. 1, 1888.

GLEANINGS FROM THE GERMAN JOURNALS.

By F. X. Moerk, Ph. G.

Carbohydrates in urine.—N. Wedenski, by precipitation with benzoyl chloride in presence of NaOH, obtained the compound ethers of two carbohydrates, of which one was decomposed by boiling with excess of NaOH; the other was not acted upon by this reagent but was afterward easily decomposed by boiling with dilute H_2SO_4. The former corresponds to the compound ether of the starch group, the latter to the glucose group. Fehling's solution is reduced by the latter, but only after treatment with dilute acids by the former; this also answers to the test for animal gum found by Landwehr in urine by precipitating with copper sulphate, washing, drying, dissolving in HCl adding alcohol when the substance is reprecipitated, especially on warming to 60°.—*Ztschr. f. Physiol. Chemie*, xiii, 122.

Digitalis ambigua, which in some countries is more common than D. purpurea, contains according to Paschkis, the same constituents found in D. purpurea. Following the method of Schmiedeberg he obtained digitonin, digitonein, digitoginin, digitalin, digitalein and digitoxin. In an aqueous extract chrysophanic acid was detected. The medicinal properties of the two drugs are identical.—*Apoth. Ztg.*, 1888, 869.

Diphenylmethylpyrazol analogous in composition with antipyrine and used for the same purpose, is made by the action of benzoyl-acetic ether upon phenyl-hydrazine and then introducing the methyl group. It forms white needles melting at 150°, is difficultly soluble in water and ether, easily soluble in alcohol and glacial acetic acid, and differs from antipyrine in being a strong base; also in the reactions with nitric acid and with ferric chloride, these not being so characteristic.—(*Ztschr. f. Angew. Chem.*) *Pharm. Centralh.*, 1888, 463.

Iodoform in its behavior towards ether differs considerably, some brands marked *absolute* giving with this solvent dark colored solutions owing to liberation of iodine, probably due to an impurity of the iodoform which is decomposed by ether.—*Neuss, Pharm. Ztschr. f. Russl.*, 1888, 681.

Benzoic Acid crystals on vanilla beans may be distinguished microscopically from vanillin; the former are needle-shaped, the latter tabular crystals. Dilute sodium carbonate will extract the former and on acidifying with sulphuric acid and adding a little metallic magnesium

or zinc the odor of oil of bitter almonds will be developed.—*Schimmel & Co., Pharm. Centralh.*, 1888, 537.

Antiseptic sponges for gynæcological operations.—The sponges are placed for 2 hours in a solution composed of corrosive sublimate 1·0, carbolic acid 5·0, alcohol 60·0, water 500·0; after expression they are allowed to dry in the air and may be impregnated with one of the following solutions: I. Boric acid 15·0, boiled water 500; II. Tannin 30, boiled water 500·0; III. Solution ferric chloride 40·0, boiled water 500.0.—*Pharm. Centralh.*, 1888, 558.

Filicic Acid.—G. Daccomo prepared the acid by agitating the ethereal extract (oleo-resin) with a mixture of two volumes 95 per cent. alcohol and one volume ether, which precipitated the acid as a brown resinous mass. After purification a glistening, odorless pale-yellow crystalline powder was obtained, melting at 179–180°. Heated above 100°, it assumes a golden color, taking the original color again on cooling. Insoluble in water, sparingly soluble in absolute alcohol; more soluble in glacial acetic acid, ether, amylic alcohol and toluol; easily soluble in chloroform, carbon disulphide and benzol. Its formula is $C_{14}H_{16}O_5$. Heated in a sealed tube to 170–190°, it is decomposed into isobutyric acid, and a red substance, having the formula $C_{20}H_{18}O_7$. $C_{14}H_{16}O_5+H_2O=C_4H_8O_2+C_{10}H_{10}O_4$. Two molecules of the last substance, by loss of one molecule of H_2O, give the compound $C_{20}H_{18}O_7$. By oxidation with $K_2Mn_2O_8$, and also with HNO_3, butyric and oxalic acids are formed. If the compound $C_{20}H_{18}O_7$ be allowed to stand several days with HNO_3, from the solution can be obtained pearly scales, melting between 198° and 202°, sublimable, the sublimate melting at 127–129°; by analysis found to be phthalic acid; oxalic acid is also formed by this oxidation. These reactions indicate that filicic acid is the isobutyrate of oxynaphthoquinone.—*Ber. d. d. Chem. Ges.*, 1888, 2962.

Cantharides.—Baudin has found that this drug appears in the market, partially deprived of the cantharidin by extraction with a menstruum containing sulphuric acid; the ash then contains an undue amount of sulphate. In determining the cantharidin, he recommends it to be carried out in two stages; first, exhausting with chloroform, which removes the free cantharidin, and then with chloroform containing 2 per cent. HCl, which dissolves the combined cantharidin. Cantharides contain about 1 per cent. total cantharidin, 0·72 per cent. free, and about 0·3 per cent. combined.—*Apoth. Ztg.*, 1888, 921.

Pilulæ odontalgicæ.—Cocaine hydrochlorate 16·0, powdered opium 64·0, menthol 16·0, powdered althæa 48·0, mix with glycerin and mucilage of acacia and divide into pills each weighing 0·03. One pill to be placed in the cavity of the tooth.—*Apoth. Ztg.*, 1888, 921.

Fragrant sulphur balsam.—The medicinal sulphur balsam prepared by heating together sulphur with Venetian turpentine and oil of turpentine, is of a very disagreeable odor and taste. By substituting for the oil of turpentine, olive oil, a pleasant fragrant product results.—*H. Borntræger, Chem. techn. Zeitung.*, 1888, 739.

Atomic weight of tin determined by Bougartz and Classen is 118·8 (O=15·96) or 119·1 (O=16). This is the mean of 26 (out of 47) determinations made by decomposing by electrolysis $SnCl_4 + 2\,NH_4Cl$ and $SnCl_4 + 2\,KCl$. The other 21 determinations were made by electrolysis of $SnBr_4$ and oxidation of Sn to SnO_2 but these showed greater differences between maximum and minimum and hence were omitted.—*Ber. d. d. chem. Ges.*, 1888, 2900.

Paraffin in crude petroleum, and lubricating and burning oils can be estimated by agitating 5–20 cc. of the sample with 100–200 cc. glacial acetic acid, collecting the separated paraffin on a weighed filter, washing first two or three times with the acid and then several times with 75% alcohol, drying and weighing ; or the insoluble portion can be dissolved off the filter by petroleum ether into a weighed beaker, evaporated, dried and weighed.—*Pawlewski and Filemonowicz, Ber. d. d. chem. Ges.*, 1888, 2973.

Insect powder colored with curcuma can be told by making an alcoholic tincture, concentrating on a water-bath and impregnating strips of filter paper with the residue. These strips with boric acid give an orange-red color, on addition of NaOH turning green. Insect powder, composed of the flowers only, should give an ash of a decided green color, due to the pressure of manganese compounds ; the stems are almost free from manganese. Barium chromate has been used to impart color to the insect powder.—*C. Schwarz, E. Ritsert, Pharm. Ztg.*, 1888, 692, 715.

Rubber drains may be hardened by immersion of the rubber tubing (red tubing is the best) for five minutes in concentrated sulphuric acid (whereby a dark brown color is imparted) washing with 75 per cent. alcohol and disinfecting by macerating in a 5 per cent. carbolic acid

solution or in a 1 to 2 per cent. mercuric chloride solution.—(*Med. Chir. Rdsch.*) *Pharm. Centralhalle,* 1888, 572.

Pure glycerin should conform to the following tests: 1. neutrality towards litmus paper; 2. complete volatility between 150° and 200°, one drop heated on an object-glass over a moderate flame should leave no residue; 3. non-reducibility of ammoniacal silver nitrate, 1 cc. of the sample heated to the boiling point with 1 cc. ammonium hydrate and five drops of silver nitrate solution added should not become colored nor deposit a precipitate within five minutes.—*E. Ritsert, Pharm. Ztg.,* 1888, 715.

Cotton-seed oil in olive oil.—E. Hirschsohn discovered that a chloroformic solution of auric chloride (1 gm. in 200 cc.) gave on warming with cotton-seed oil an intense raspberry-red color, while pure olive oil with the same reagent gave no reaction. To apply the test, 3 to 5cc. of the oil with 6-10 drops of the auric chloride solution are placed in a water-bath and heated to 100° for twenty minutes. *Cotton-seed oil* develops the color in a few minutes; of other oils tested *hemp, linseed, poppy, almond, olive, rape, turnip, mustard, sesamum, sunflower, peach-kernel* and *grape-seed oils* gave no reaction; *peanut* and *castor oils* gave a slight deposit of metallic gold without imparting any color to the oils. The addition of 20% cotton-seed oil to the *drying oils* could not be detected, while the addition of 10% could be detected in *peanut, poppy, turnip, castor, olive, sesamum, almond* and *sunflower oils.* The prettiest tests were gotten with olive, sesamum and almond oils. Further experiments with olive oil proved that the addition of *one per cent.* of cotton-seed oil could certainly be detected by the method given above. By noticing the depth of color and the time required to produce it approximate results can be obtained. —*Pharm. Ztschr. f. Russl.,* 1888, 721.

Hydrochlorate of Apomorphine has been extensively tried by Dr. Socquart, of Brussels, as a remedy for certain kinds of cough, particularly in distressing and frequent hacking, unattended with expectoration, or with exceedingly difficult expectoration. The drug is, as a rule, well borne, although a few individuals manifest a special susceptibility to its action, and rarely nausea, colic, and diarrhea result from its employment. The dose is only about one-twentieth grain, given in water in the twenty-four hours. As the solution rapidly alters by keeping, it is advised to prevent its decomposition by the addition of a few drops of hydrochloric acid, which does not interfere with the therapeutic effects.—*Weekly Med. Rev.,* April 28, 1888.

DENSIMETRIC ESTIMATION OF ALBUMIN IN URINE.[1]

By Záhor.

Although it has been shown that from the theoretical side there is much to be urged against the densimetric method, yet it is found in practice, in cases where accuracy to the first place of decimals is sufficient, that the method is extremely quick and handy. This is felt nowhere so much as in estimations of albumin in urine, and the following method is simple, and can be carried out clinically :—

The filtered urine is mixed with just so much dilute acetic acid that when it is boiled all the albumin is coagulated ; the right proportion may be ascertained with a small quantity of the urine in a test-tube beforehand. On being filtered from the coagulum, the filtrate should give no cloudiness with acetic acid and potassium ferrocyanide. A quantity of the urine is then placed in a flask firmly closed with a clean caoutchouc stopper. The flask is hung for 10 or 15 minutes in a large bath, filled with water kept boiling. By this means the albumin is precipitated. It is then filtered off, the funnel leading through a cork with a hole in it into a flask, and being covered with a glass plate. The density of the urine and the filtrate is then estimated, not with a pycnometer (that is unnecessary for clinical work), but with an aräometer marked to four places of decimals. Both fluids must be kept at the same temperature. This is best done by placing them in two cylinders, both immersed in a large vessel of water, which should be kept at the same temperature if a series of observations are to be made. The temperature of 17·5° degrees will be found most convenient. The difference between the two specific gravities is then multiplied by 400, and the product gives the number of grams of albumin in 100 cc. of urine.

A large number of illustrative experiments are quoted, in which the approximate accuracy of this simple process is demonstrated. The number 400 is the mean in round numbers of the factor $\frac{100v_2}{v(v_2 - v_1)}$.[2] The question naturally arises why a constant factor should give such good results in albuminous urine, when not only theo-

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[1] *Zeit. physiol. Chem.*, xii., 484–495 ; reprinted from *Jour. Chem. Soc.*, Nov., p. 1227.

[2] v is spec. grav. of the urine ; v_2, spec. grav. of the proteids ; v_1, spec. grav. of urine minus proteids.

retically but also in practice it yields fallacious results in other albuminous fluids, such as the blood, transudations, white of egg, etc. The reason is that the factor must be multiplied by the difference in the specific gravities. In proteïd solutions (other than albuminous urine) this difference varies from 0·0016 and 0·0128, whilst in albuminous urine this difference is much smaller, varying between 0·00012 and 0·00200; that is, in the former case the difference is from 6 to 13 times greater than in the latter, and therefore so many times greater will be the error introduced by the use of a constant factor. In the case of urine, this error may be neglected.

ON THE ACIDS OF GASTRIC AND INTESTINAL JUICES.[1]

By Dr. Poulet.

The author's method of obtaining the acid principle of the stomach and intestine consists in dialyzing either the contents of the stomach or intestine obtained from an animal in full gastric or intestinal digestion, or the scrapings of the gastric or intestinal mucous membrane. After dialyzing for twenty-four hours, the resulting liquid is evaporated at a gentle heat down to about thirty grams, and then treated in a wine-glass with sulphuric acid. In the case of the stomach of the pig and man hippuric acid in abundance crystallizes out; in that of all carnivorous animals, tartaric acid, whilst tartaric acid is found to be the acid separated from the intestine. It would be tedious to follow the author through the exposition of his methods and results at any length. His conclusions have certainly the charm of novelty, but many objections present themselves to his method as a means of obtaining the free acid secreted either in the stomach or intestine. It will be sufficient to give his conclusions as summarized, and to refer for details to the original paper.

The gastric juice of omnivorous adults, and notably of healthy men, contains, in the first stage of digestion, hippuric acid alone. Towards the end of the digestive act a mixture of hippuric and tartaric acids is found. The latter is alone found in the secretion of the mucous mem-

[1] "Nouvelles recherches expérimentales sur les principes acides du suc gastrique et sur celui du suc intestinal" in *Archiv. de physiolog. norm. et pathol.*, Oct. 1st, 1888; abstract reprinted from *The Medical Chronicle*, December.

brane of the empty stomach. Before weaning, tartaric acid is the chief acid found. Since tartaric acid has been found to be the acid secreted by all carnivora, recourse must be had to the pig, which in its dental and digestive system corresponds with man, in future experiments.

In dyspeptic men, a quarter of an hour after eating, tartaric acid and hippuric acid were found together. It may be conjectured that in grave diseases of the stomach hippuric acid may be entirely replaced by tartaric.

In all the cases examined in healthy or sick men, and also in animals, no lactic or sarcolactic acid was found.

The hippuric acid of the gastric juice possesses all the properties of that extracted from the urine of herbivora in crystallization, physical aspect, and reduction to benzene by dry distillation with caustic potash, mixed or not with quick lime. But the tartaric acid of the gastric juice differs from the vegetable acid in some of its properties, especially in that it is attacked and decomposed in the cold by concentrated sulphuric acid.

The reactions of dialyzed gastric juice on coloring matters differ very much from those of hydrochloric acid. On the contrary, they resemble either those produced by hippuric acid or tartaric acid. The yellow color of Uffelmann's reagent, which has been attributed exclusively to lactic acid, may be just as well due to tartaric or hippuric acid, and is not characteristic, therefore, of the former.

When a dilute solution of hydrochloric acid is added to Gunzburg's reagent, and it is heated, a red color appears, at a temperature of 75° to 78°. A similar color is produced by hippuric acid, but at a temperature of 105° to 108°. It is, therefore, incorrect to assert that only inorganic acids produce the red color, and that Gunzburg's solution is the reagent for hydrochloric acid. When normal gastric juice is used it is not at 75° that the red coloration appears, as would be the case if it contained hydrochloric acid, but the temperature must be raised to 105°, precisely that at which it is acted on by hippuric acid.

The intestinal juice is acid in the whole extent of the small intestine during the period of intestinal digestion. The principle which acidifies it is none other than the same tartaric acid which is secreted by the mucous membrane of the empty stomach, in young animals during lactation, and in adult carnivora during digestion.

JAS. MCNAUGHT.

CHEMICAL OBSERVATIONS ON TARTAR EMETIC.[1]

By Prof. Dunstan and Miss L. E. Boole.

Communication from the Research Laboratory of the Pharmaceutical Society.

1. ON SOME STATEMENTS IN THE BRITISH PHARMACOPŒIA.

For the determination of the antimony in tartar emetic the pharmacist may be supposed to rely on the process described in the British Pharmacopœia. "Twenty-nine grains dissolves (*sic*) slowly but without residue in a fluid ounce of distilled water at 60° F. (15·5° C.), and the solution gives with sulphuretted hydrogen an orange precipitate which when washed and dried at 212° F. (100° C.) weighs 15·1 grains."

These instructions stand in need of considerable amendment to render them of any service in practice. Unless the solution is first acidified, oxy-salt is invariably carried down with the sulphide, and this together with free sulphur, will cause the result to be higher than that which is demanded by the known composition of the salt. Acid tartrate of potassium is also precipitated, and it is difficult to remove the whole of this salt from the precipitate unless it is washed with an unusually large quantity of water. Further, it is extremely difficult to filter the finely divided sulphide, in fact, it is almost impossible to do so, unless the liquid containing the precipitate is boiled for some time; but this generally leads, when free acid is present, to the decomposition of some of the sulphide, and in this way error is introduced. Again, antimony sulphide cannot be completely dried at 100° C. A small quantity of water, about two per cent., is obstinately retained, and is only lost with difficulty at a higher temperature; indeed, according to Fresenius, even at a higher temperature a current of carbon dioxide is necessary to effect its entire expulsion. It is chiefly for these reasons that chemists in general have long since abandoned the method of directly weighing the antimony sulphide, and yet the process is adopted, as a test of purity, in the British Pharmacopœia without any allusion to these various sources of inaccuracy. Lastly, it should be observed that the amount of antimony sulphide represented by the Pharmacopœia as obtainable from 29

[1] Read before the Pharmaceutical Society of Great Britain at an Evening Meeting in London, Wednesday, November 14, reprinted from *Phar. Jour. and Trans.*, Nov. 17.

grains of tartar emetic is 15·1 grains, whereas the quantity demanded by the formula of the salt ($SbOKC_4H_4O_6$, $\frac{1}{2}H_2O$) is only 14·67 grains.

2. THE VOLUMETRIC ESTIMATION OF THE ANTIMONY IN TARTAR EMETIC.

Having regard to the extensive employment of tartar emetic in medicine, it is clearly desirable that a trustworthy and simple method for its quantitative analysis should be available for use by the pharmacist. A volumetric process has been proposed which involves the use of standard solutions of bleaching powder and potassium arsenite. For the pharmacist this process is inconvenient, since it necessitates the employment of two volumetric solutions which must be specially prepared.

It seemed worth while to attempt to utilize, for a volumetric process, the decolorization of a solution of iodine, which is effected by a solution of tartar emetic, on the basis of the reaction

$$SbOK{\cdot}C_4H_4O_6 + I_2 + 2H_2O = 2HI + KHC_4H_4O_6 + HSbO_3.$$

Mohr had already proposed to utilize this oxidation as a volumetric operation applicable to antimonious compounds, and on his recommendation the process is not infrequently described in treatises on volumetric analysis. The method has been tested by Fresenius, whose results were not quite satisfactory, being in general slightly too high. It appeared desirable that a further trial of the method should be made.

Tartar emetic was several times crystallized from water, and the crystals dried by exposure in a partial vacuum. To establish the purity of these crystals the amount of potassium was determined. As this proved to be a troublesome operation, it may be well to give some account of the different experiments which were made, as well as of the method finally adopted. In order to separate the potassium it was necessary first to remove the whole of the antimony from a solution of the salt. Many attempts were made to effect this removal by means of hydrogen sulphide, but these failed, chiefly for reasons which have already been alluded to. Neither was it found practicable to remove the antimony by the evaporation of a solution acidified with hydrochloric acid, since a small quantity of antimony was dissolved when the residue, left on ignition, was boiled with water. Simple ignition

of the salt and extraction of the mass with water failed for the same reason. The plan which answered best was to precipitate a solution of the salt with ammonia, which effected the removal of nearly the whole of the antimony as antimonious hydrate, a small quantity being subsequently separated during the evaporation of the ammoniacal filtrate. Since ammonium and potassium tartrates remain dissolved it is necessary before the potassium can be estimated to ignite the residue left after evaporation. This is accomplished at a low red heat, and the carbonaceous mass is boiled and washed with water, and the potassium finally precipitated as platinochloride in the usual manner, or more simply, the solution may be titrated with an acid solution of known strength. Working in this way, 1·7408 gram of tartar emetic yielded an ash containing 0·3615 gram of potassium carbonate; the quantity of potassium carbonate calculated from the formula $SbOKC_4H_4O_6, \frac{1}{2}H_2O$ is 0·3617 gram. Having thus established the correspondence of the crystals with the formula ($SbOKC_4H_4O_6, \frac{1}{2}H_2O$) they were used in the subsequent experiments. Trials were first made with solutions of tartar emetic acidified with hydrochloric acid, which were titrated with a decinormal solution of iodine, using starch as an indicator. The quantity of hydrochloric acid added was, in each experiment, exactly sufficient to form potassium chloride from the tartar emetic. The dilution of the solution was varied, but without appreciably affecting the results. Although some of the experimental data recorded below agree fairly well with the calculated numbers, yet the method cannot be trusted, on account of the absence of any sharp termination of the reaction, which lags increasingly with each addition of iodine. This difficulty sufficiently explains the discrepancies in the results, which are here recorded :—

Tartar emetic taken.	Dilution of the liquid.	Tartar emetic found.
0 10	40	0·098
0·10	60	0·097
0·10	80	0 099
0·20	160	0·195
0·20	100	0 195

Experiments were next made with solutions of tartar emetic to which sodium bicarbonate had recently been added. When this salt is dissolved in a solution of tartar emetic no visible change is observed at first, but after the lapse of a few minutes the liquid becomes turbid,

and gradually nearly the whole of the antimony falls as a white precipitate of antimonious hydrate.

$$NaHCO_3+Sb.OK.C_4H_4O_6+H_2O= KNaC_4H_4O_6+Sb(OH)_3+CO_2.$$

If a solution of iodine is added to the liquid before the precipitation has commenced it is immediately decolorized, and a sharp termination of the reaction is observed. If, however, the solution of iodine is not added until precipitation has commenced, then wholly incorrect results will be obtained, since the precipitated hydrate is hardly attacked by the iodine. To illustrate the importance of accomplishing the reaction before precipitation has set in, an experiment may be quoted in which two solutions of tartar emetic containing precisely the same quantity of the salt were mixed with an equal quantity of sodium bicarbonate. In the one solution, titration with iodine was immediately performed, when it was found that 18 cubic centimetres of the decinormal solution of iodine were consumed. In the other solution titration was not commenced until after the lapse of some hours, by which time nearly the whole of the antimony had been precipitated. The mixture was now found to require less than half a cubic centimetre of the solution of iodine to complete the oxidation of the small quantity of antimony compound which had not been precipitated. For this reason, a solution of bicarbonate should be added to the dissolved tartar emetic immediately before the titration is conducted. In the experiments recorded below from 10–20 cubic centimetres of a five per cent. solution of sodium bicarbonate were employed, and the dilution of the solution was varied. We have not found a large quantity, either of sodium bicarbonate or of water, to affect the chemical change to any appreciable extent. In practice, it will be found that 0·2–0·3 gram of tartar emetic is a convenient quantity to take for each estimation.

Tartar emetic taken.	Dilution.	Tartar emetic found.
0·1 gram	80 cc.	0·100
0·1 "	100 "	0·100
0·2 "	20 "	0·200
0·2 "	100 "	0·200
0·4937 "	100 "	0·4926
0·5472 "	100 "	0·5465

These results conclusively prove that the reaction occurring between solutions of tartar emetic and iodine in the presence of sodium bicarb-

onate is quite definite, and may be utilized as the basis of a volumetric operation in which solutions of tartar emetic, with sodium bicarbonate, are titrated with a decinormal solution of iodine in the usual manner.

3. ACTION OF ALCOHOL ON AN AQUEOUS SOLUTION OF TARTAR EMETIC.

When alcohol is added to an aqueous solution of tartar emetic a white precipitate is produced. This has been alleged to consist either of finely divided hydrous crystals or perhaps of the anhydrous salt. The use of anhydrous salt in quantitative experiments such as we have conducted is of much assistance, since the hydrous crystals are liable to alter their composition, owing to efflorescence. We therefore investigated the composition of this precipitate after it had been quickly dried, first at 50° C., and finally in a partial vacuum, over calcium chloride. The white powder was dissolved in water and the liquid was titrated with a solution of iodine. The results obtained were as follows:—

Weight of salt taken.	Weight of salt found, calculated as $SbOKC_4H_4O_6$.
0·1656	0·1657
0·4960	0·4957

They prove that the precipitate, prepared as above described, is entirely constituted of anhydrous tartar emetic.

3. THE SPECIFIC ROTATION OF AQUEOUS SOLUTIONS.

The action of aqueous solutions of tartar emetic on polarized light is very rarely alluded to in treatises on chemistry. Solutions of the salt are powerfully dextro-rotatory. Determinations of the specific rotation have been made by Landolt and by Krecke. Landolt found that 7·982 of anhydrous tartar emetic dissolved in 100 cc. of water effected at 20° C. an amount of rotation equivalent to $[\alpha]_D = +142·76°$. Krecke found that a five per cent. solution of tartar emetic at 25° C. effected a rotation corresponding to $[\alpha]_D = +138·66°$. We have made several determinations at 15° C. with a four per cent. solution of the crystallized salt, using a tube 200 mm. long. The angle of rotation under these conditions is +11·3°, whence $[\alpha]_D = +141·25°$, and for the anhydrous salt under the same conditions +11·4, whence $[\alpha]_D = +142·5°$. This result is probably in agreement with that obtained by Krecke at 25° C., since it is known that an increase of

temperature causes a decrease in the specific rotation of this compound.

It is a remarkable fact that a solution of tartar emetic possesses a much greater specific rotation than a corresponding solution of any of the commonly-occurring tartrates. For acid tartrate of potassium, for instance, $[\alpha]_D = +22{\cdot}61°$. The high specific rotation is therefore characteristic of tartar emetic, and might be usefully employed as a test for the purity of salt. Thus we have found that an admixture of five per cent. of acid tartrate of potassium with tartar emetic reduces the rotatory power of a 4 per cent. solution of the salt to $+10{\cdot}6°$ (200 mm. at 15° C.) that is for $[\alpha]_D + 132{\cdot}5°$.

By means of its action on polarized light a solution of tartar emetic may readily be distinguished from any of the double oxalates of antimony and potassium, which are used in dyeing as substitutes for tartar emetic, since solutions of these salts are devoid of action on polarized light.

4. AN EXAMINATION OF COMMERCIAL SPECIMENS.

It seemed to be of interest to determine the purity of the tartar emetic employed in medicine. Twelve specimens were purchased from pharmacists. The antimony was estimated by titration of the dissolved salt with a standard solution of iodine in the manner previously described. The results were as follows:—

Analyses of Commercial Specimens of Tartar Emetic.

No. of specimens.	Weight of salt taken.	Weight of salt found.	Percentage of ($SbOKC_4H_4O_6,\frac{1}{2}H_2O$).
1	0·236	0·2415	102·3
2	0·3515	0·3554	101·1
3	0·2584	0·2608	100·9
4	0·2218	0·2221	100·1
5	0·2511	0·2491	99·2
6	0·2649	0·2633	99·4
7	0·3373	0·3336	98·7
8	0·2602	0·2562	98·4
9	0·2894	0·2825	97·6
10	0·2305	0·2235	96·9
11	0·2539	0·2426	95·5
12	0·2434	0·2305	94·7

It will be seen that many of these specimens are of such purity as one might reasonably look for in commerce. It is noticeable, how-

ever, that several specimens have yielded more antimony than is obtainable from a salt of the formula ($SbOKC_4H_4O_6,\frac{1}{2}H_2O$). We have investigated the cause of this anomaly and find it to be due to the absence from the salt of the proportion of water indicated by the usual formula, loss having occurred from the efflorescence of the crystals, which readily takes place when they are kept in air. That this is the cause of the discrepancy was proved by estimating the water in a specimen which had afforded an anomalous result. The specimen selected for this purpose was that numbered 1 in the foregoing table, which contained an amount of antimony corresponding to 102·3 of crystallized tartar emetic. This salt, on being dried between 100°–110°, lost only 0·52 per cent. of water, instead of 2·72 per cent., and by calculating, on this basis, the percentage of crystallized tartar emetic, it is found to be 102·2 per cent., a result which agrees with that obtained by the direct determination of the antimony. The occurrence of efflorescence to a greater or less extent therefore explains these high results.

A few specimens afforded results rather below the average, notably the specimen numbered 12 in the table. None of these specimens dissolved completely in the necessary quantity of cold water. Two grams of the specimen numbered 12 in the table were warmed to about 50° C. with 34 cc. of water. This liquid when cooled to 15° C. and maintained for some hours at that temperature yielded crystals which were recognized as acid tartrate of potassium. The potassium in the salt was also estimated and found to be higher than that required by the formula ($SbOKC_4H_4O_6,\frac{1}{2}H_2O$). The rotatory power of a 4 per cent. solution was determined at 15° C. in a tube 200 mm. long. The angle of rotation was + 10·5°, whence $[\alpha]_D$=131·25°, a result which approximately agrees with that which had been previously obtained with a solution of tartar emetic known to contain 5 per cent. of acid tartrate of potassium. It was thus proved that the specimen contained about five per cent. of acid tartrate of potassium. This specimen, which was in fine powder, had also probably suffered efflorescence, but we had not a sufficient quantity to determine whether this was the case. Whether this impurity had been fraudulently added, or had arisen from careless preparation of the salt or from a mode of decomposition of the pure sale at present unknown, it is impossible to say. Inasmuch as other specimens which afforded low results likewise failed to completely dissolve in the requisite quantity of cold

water and also appeared to contain acid tartrate of potassium, it seems not improbable that the crystallized salt is subject to spontaneous decomposition. This supposition is strengthened by the observation that each of these same specimens yielded, when mixed with cold water, more or less of an insoluble residue consisting of antimony oxide. Experiments are now being made with pure tartar emetic to test the correctness of this suggestion.

5. THE PREPARATION OF A STABLE SALT FOR USE IN MEDICINE.

It would be a distinct advantage if it were required that the anhydrous salt should alone be used in medicine. It is, as we have shown, easily prepared pure, and when once prepared it is not, as the hydrous crystals are, liable to spontaneous change, and in addition it is more readily soluble in water. To prepare the anhydrous salt a strong aqueous solution of tartar emetic is precipitated by a large excess of methylated spirit, the precipitate is decanted or filtered, washed with methylated spirit, and quickly dried over a water-bath. The specific rotation of aqueous solutions of this salt has been mentioned in a previous part of this paper. The solubility in water was determined at 15°. It was found that one part of the salt dissolved in 14·53 parts by weight of water.

ISATROPYLCOCAINE.[1]

By C. LIEBERMANN.

An alkaloid which the author names isatropylcocaine is present in the mixture of amorphous alkaloids obtained as a bye-product in the preparation of cocaine.

Isatropylcocaine, $C_{19}H_{23}NO_4$, is prepared in the pure state as follows: the yellow, sticky, amorphous mixture is dissolved in hydrochloric acid and the filtered solution extracted with ether. The extract contains considerable quantities of benzaldehyde. The solution is freed from ether by means of a stream of air and the base precipitated fractionally with alkali. It is then obtained in the form of a white, chalky, amorphous powder, the quantity of which is about 70 per cent. of the crude material. The middle fractions are dissolved in hydrochloric acid, again fractionally precipitated with soda, extracted with light petroleum to remove traces of cocaine, and dried in a

[1] *Ber.*, xxi., 2342–2355; *reprinted from Jour. Chem. Soc.*, Nov., p. 1210.

stream of air for several days at the ordinary temperature, and finally at 45°.

The alkaline filtrate from the alkaloid contains ecgonine, the quantity of which is from 1 to 2 per cent. of the crude material.

Isatropylcocaine is very similar to cocaine, but both the base and its salts are amorphous, and the former is not so readily soluble in ammonia and light petroleum as cocaine. It is easily soluble in cold alcohol, ether, benzene and chloroform, but only very sparingly in light petroleum, and in all cases a resinous mass is obtained when the solvent is evaporated. It begins to soften at 65°, but has no definite melting point; at 90–100° it loses water slowly, and at 120° it turns brown and is gradually decomposed. All the salts are amorphous and soluble in water. Picric acid produces a yellow, chromic acid an orange, and potassium permanganate a violet precipitate, which changes to brown. The chlorides of mercury, tin, gold and platinum, and most of the usual reagents for alkaloids, also give amorphous precipitates. The alcoholic solution does not show an alkaline reaction with phenolphthalein, and is dextrorotatory.

The base is a powerful poison, but its action is not similar either to that of cocaine or atropine; the symptoms of poisoning sometimes observed after the administration of impure cocaine may be due to this alkaloid.

Methyl chloride is evolved when the base is heated with concentrated hydrochloric acid, and when boiled with strong hydriodic acid methyl iodide is obtained, the quantity of which, estimated by Zeisel's method, showed that one methyl-group has been eliminated. It is also decomposed, with separation of methyl alcohol, when heated for a long time with dilute sulphuric acid, but no ethyl alcohol is formed. When boiled for about an hour with hydrochloric acid, sp. gr. 1·1, it is decomposed into methyl alcohol, ecgonine, and isatropic acid in molecular proportions, as in the following equation:

$$C_{19}H_{23}NO_4+2H_2O=CH_4O+C_9H_{15}NO_3+C_9H_8O_2.$$

The product of the reaction is filtered and the two isatropic acids in the residue separated by means of their barium salts.

γ-Isatropic acid, $C_9H_8O_2$, forms about two-thirds of the residue. It crystallizes from 50 per cent. alcohol in small, colorless needles, melts at 274°, and is soluble in hot glacial acetic acid, but only very sparingly in ether, benzene and carbon bisulphide. The *barium* salt,

$(C_9H_7O_2)_2Ba$, is crystalline, and readily soluble in water. The *calcium*, *copper* and *silver* salts are soluble in water. The ethyl- and methyl-derivatives are very readily formed when hydrogen chloride is passed into a solution of the acid in the corresponding alcohol. The *ethyl* salt, $C_9H_7EtO_2$, is insoluble in ammonia and sparingly soluble in alcohol, from which it crystallizes in needles melting at 146°. *Methyl γ-isatropate*, $C_9H_7MeO_2$, crystallizes in plates or needles, melts at 174°, and distils at about 300° with very slight decomposition, but has no constant boiling point. A vapor-density determination in anthracene vapor showed that it is at first polymeric, and is only completely transformed into the simple molecule after about half an hour's heating.

δ-Isatropic acid, $C_9H_8O_2$, forms about one-third of the residue. It is more easily soluble in water than the γ-acid, and melts at 206°. Neither this nor the γ-acid yields benzaldehyde when oxidized with potassium permanganate or chromic acid. An aqueous solution of the ammonium salt gives precipitates with calcium chloride, mercuric chloride, and copper acetate. The *barium* salt, $(C_9H_7O_2)_2Ba$, is sparingly soluble in water. The *silver* salt, $C_9H_7O_2Ag$, is amorphous, but becomes crystalline when boiled with water. The *ethyl* salt, $C_9H_7EtO_2$, is a viscid oil; it has no constant boiling point, but after boiling for a long time it distils at 264–270°, and condenses to a colorless, mobile oil. The *methyl* salt, $C_9H_7MeO_2$, crystallizes from dilute alcohol in prisms or needles, melts at 76°, and is readily soluble in all solvents except water. A vapor-density determination in anthracene vapor showed that it is at first polymeric, but, the transformation into simple molecules takes place much more quickly than is the case with the corresponding salt of the γ-acid.

The acids described above are very similar in appearance and solubility to α-isatropic acid (Lossen, *Annalen*, cxxxviii, 235), β-isatropic acid (Fittig, *Annalen*, ccvi., 34), and the isatropic acids which the author has previously obtained from atropine, but they are not identical with any of these compounds. β-Isatropic acid seems to be formed when hydrogen chloride is passed into a methyl alcoholic solution of α-isatropic acid. *Methyl β-isatropate* melts at 91°.

The molecular weight of δ-isatropic acid, methyl and ethyl δ-isatropate, and methyl and ethyl γ-isatropate was determined by Raoult's method in glacial acetic acid solution, and in all cases the results agreed for the molecular formulæ given above; the salts are all reprecipitated unchanged when water is added to the glacial acetic acid solu-

tion. The acid filtrate from the atropic acids (see above) contains ecgonine and a very small quantity of a complex mixture of acids consisting principally of *s*-isatropic acid, but in which benzoic acid was recognized. Anhydroecgonine is also sometimes present. The quantities of ecgonine and isatropic acids are approximately in accordance with the equation given above.

Boiling baryta decomposes the amorphous alkaloid in a similar manner to hydrochoric acid, but the ecgonine is partially decomposed.

Other bases occurring with cocaine also yield ecgonine when treated with acids. The author has succeeded in preparing benzoylecgonine from ecgonine.

MASSOI BARK.

By E. M. Holms, F. L. S., Curator of the Museum of the Pharmaceutical Society of Great Britain.

Some specimens of the barks known in the East under this name, and which were recently presented to the Museum of the Society by Professor Van Eeden, of Haarlem, may possibly serve to throw some light upon a product concerning which some little confusion still exists in commerce.

The name of Massoi appears to be given to three distinct barks, which are identified by Dr. F. Hekmeyer as the products respectively of *Cinnamomum xanthoneuron*, Bl., *Cinnamomum Kiamis*, Nees, and *Sassafras Goesianum*, T. and B. The second is also called by the Malays "Kayu manis sabrang."[1]

The first of these, as received from the Haarlem Museum, occurs in pieces about 3 to 4 lines thick, with a thin, uneven, outer dark layer, which is seen under a lens to be composed of stratified cells; the layer beneath this is granular, the white sclerenchymatous bundles being irregularly arranged in a direction parallel to the surface, except near the inner surface, where they form two nearly regular lines. The portion next the inner surface is darker in color, forming rather more than one-third of the thickness of the whole bark, and shows numerous thin medullary rays. It is this portion of the bark that appears to be most oily and aromatic. The odor, when observed at a distance,

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[1] The name "sabrang" distinguishes it from the bark Kayu manis (*Cinnamomum Parthenoxylon*), which is also used by the Malays in colic and diarrhœa. Kayu manis, as represented in the late Colonial Exhibition in London, differs from all the above-named barks in having a somewhat camphoraceous taste.

resembles that of cocoanut milk. The taste is pungent, the flavor somewhat resembling the odor, but also recalling that of a mixture of cinnamon and rue.

The second bark is in quills like cinnamon, but as thick as cassia, somewhat wrinkled externally, extremely hard and woody, and is almost horny in consistence. It has very little odor, but a pungent taste, and a slight flavor between that of cinnamon and cassia. The inner surface is finely striated, and the transverse fracture is dark internally and paler towards the outer surface.

The third bark is thinner than the first, but resembles it in odor. The taste also is very similar, but more pungent and faintly bitter, causing a sensation of heat in the mouth for some time and an augmented flow of saliva. The bark is, however, only half the thickness, barely attaining two lines. It is paler in color in transverse section, is marked externally with faint longitudinal cracks, and is more markedly striated internally. In transverse section it presents a short granular fracture, the sclerenchymatous bundles being arranged at right angles to the surface, but the middle layer, corresponding to that of *C. xanthoneuron* in which these bundles are horizontally placed, is scarcely developed. *Cinnamomum xanthoneuron* and *Sassafras Goesianum* are both natives of New Guinea, and *C. Kiamis* of Java, Sumatra, and apparently also of Borneo.

All these barks are met with in the bazaars in Java, and are used in cases of colic and diarrhœa and in spasmodic affections.

According to Teysmann and Binnendyk *Sassafras Goesianum* yields the true massoi bark.

In the Hanbury Collection there is also a bark labelled massoi bark, corresponding exactly in structure, taste, and odor with the bark of *S. Goesianum.* It is labelled on the bark, apparently in the writing of Mr. Thos. Hanbury: "This bark I bought at a Kling shop; they could tell me nothing about it, except that it was used to scent or flavor medicines."

On the outside of the box it is labelled, in Daniel Hanbury's writing, "CORTEX MASSOI (of) *Blume's* 'Rumphia' (Laurineous?) bark, smelling like the Brazilian *Casca pretiosa.*[1] Bought at Singapore by Thos. Hanbury, 1853. Found this bark identical with that procured by Guibourt at the *Musée Japonais*, vide *Hist. des Drogues*, ed. iv., tom. ii., p. 383; compared the two at Paris, April 22, 1854."

[1] The bark of *Mespilodaphne pretiosa*, Nees.

On the inside of the cover of the same box is the following note:—
"Professor C. L. Blume, in reply to my inquiry respecting this, a specimen of which I sent him, writes thus under date January 5, 1857.

"2. Écorce ayant l'odeur de la *Casca pretiosa* du Brésil (Singapore). C'est Cortex Massoi figuré dans la *Rumphia*, quoique la face interne de votre échantillon soit un peu plus claire, ce qui parait résulter de l'age de l'arbre. Son odeur pénétrant, balsamique, tirant sur l'essence de citron, est très charactéristique.[1] Je possède de cet arbre de la Nouvelle Guinée seulement les branches avec les feuilles, ce qui me met en état de dire que c'est bien une Laurinée mais n'appartenant pas au genre de Cinnamomum."

It may be here remarked that it is very difficult to describe an odor, and although Hanbury has identified it with Guibourt's bark, Écorce de massoy de la Nouvelle Guinée,' Guibourt gives quite a different description of its odor. When the odor, as in the case of Massoi bark, resembles a mixture of odors, it is naturally likened to different products by different observers. Guibourt, in the following description of the bark, likens it to cummin.

"Telle que je me la suis procurée à une exposition qui a en lieu il y a quelques années à Paris, sous le nom de Musée japonais, cette écorce est cintrée, épaisse de 7-8 millimetres, couverte d'un épiderme gris rougeâtre legèrement tuberculeux et formée d'un libre gris rosé dur et compacte à structure un peu radiée sur sa coupe transversale. Elle possède une odeur très forte, analogue à celle du cumin, et une saveur très-âcre avec le même goût de cumin."

I have, however, not depended upon my own opinion alone, but have obtained from more than one observer a corroboration of the opinion that the odor resembles that of cocoanut milk. Leaving, however, odor out of the question, Guibourt's description of the structure of bark corresponds exactly to the bark of *Sassafras Goesianum* of the Haarlem Museum, and as the Hanbury specimen has been identified by himself with Guibourt's, and by Professor Blume, with the bark of the tree described in "Rumphia," there can be no doubt that to this tree the true Massoi bark must be ascribed.

Whether or no this be the massoy bark from New Guinea from which Messrs. Schimmel also have distilled an oil having an odor resembling that of nutmegs and cloves, cannot be ascertained in the

[1] The lemon odor is not very perceptible; in the specimen it resembles more nearly rue or the fruits of *Xanthoxylum alatum*.

absence of specimens for comparison, but if their description of the odor be correct it is more likely to be the *Cortex Culilabani Papuanus* of Martiny's *Encyclopædia*, 1, p. 436.

The specimen of this bark in the Hanbury collection has a flavor which might be likened to that of cloves and nutmegs. The bark is, however, quite different in appearance and odor from the true massoi bark,[1] being much thicker, softer, somewhat laminated, and not at all radiate in structure.—*Phar. Jour. and Trans.*, Dec. 15, p. 465.

THE ROOT OF VERNONIA NIGRITIANA.[2]

By E. Heckel and Fr. Schlagdenhauffen.

Under the name of batiatior or batjitjor a root is sold in different parts of Senegambia, which is supposed to have febrifuge, emetic, anti-hæmorrhagic, and antidysenteric properties. It has been described as a substitute for ipecacuanha, and is alluded to as such by Dorvault. It has recently been definitely recognized as the root of Vernonia nigritiana, a composite plant growing to the height of a foot or two and bears a faint external resemblance to ipecacuanha, which, when fresh, it is said to resemble in smell.

Heckel and Schlagdenhauffen find in this root no trace of any true alkaloid, but they have obtained from it a whitish, slightly hygroscopic glucoside, having the formula $C_{10}H_{24}O_7$, which they have called vernonin.

On injecting a solution of the alcoholic extract under the skin of the frog's thigh, paralysis of the limb thus injected followed, the respiratory movements were interfered with, and the heart's action was arrested in the same manner as after digitalis, convallaria, and strophanthus. On further examination of the heart movements by placing it between the cups of a Marey's cardiograph, it was found that after injecting $\frac{3}{10}$ths of a grain of vernonin the amplitude of the heart's movements was first slightly decreased and then increased, but in three-quarters of an hour they fell below normal and became slower;

[1] The name Kulit laban means clove bark, the word Laban or Lawang being probably the Malay pronunciation of the Sanskrit "Lavanga," and of the vernacular Hindostanee "Laung," which is applied to the clove, *vide* "Pharmacographia," p. 281.

[2] "Sur la racine de Batjitjor de l'Afrique tropicale, nouveau poison du cœur," in *Archiv. de physiologie normale et physiologigue*, August, 1888; abstract reprinted from *The Medical Chronicle*, Dec. See also Amer. Jour. Phar 1888, p. 347.

eventually the influence of the drug passed off. A larger dose ($\frac{3}{20}$ths grain) reduced the number of beats by one-third, the ventricles evidently filling slowly. A still larger dose ($\frac{7}{10}$ths grain) almost arrested the heart in systole, diastole only taking place imperfectly and at long intervals; eventually the heart stopped completely in systole. A pigeon was not influenced by $\frac{3}{4}$ths of a grain, but $2\frac{1}{4}$ grains killed it, the heart being arrested in systole.

The action of vernonin on the heart thus resembles that of digitalis. Heckel and Schlagdenhauffen, however, consider that it is twenty-four times weaker than the soluble principle of digitalis (digitalein).

They have studied the action of the drug on the skéletal nerves and muscles, and have come to the conclusion that it paralyzes locally nerves to which it is applied, but does not markedly influence the muscles. If the drug be injected under the skin of the thigh it soon comes to pass that galvanizing the sciatic on this side ceases to contract the muscles supplied by it, whilst muscles respond equally to the current on the two sides when directly stimulated.

Further experiments are adduced to show that the drug directly destroys the conducting power of the sciatic nerve in the frog, and that in warm-blooded animals it paralyzes the limb into which it is injected. The experimenters, however, have by no means fully shown the influence of vernonin on the nerve and muscle tissues, and some serious sources of fallacy seem to have been overlooked. It may be presumed that a drug which so powerfully influences the nerves must also affect the nerve endings, but no experiments on this point seem to have been made. No means seem to have been employed to prevent the circulation of poisoned blood from the injected to the non-injected leg; indeed, the investigations would lead to the conclusion that the drug is not thus carried, for it is stated that when the poison is injected under the skin of the back, stimulation of the sciatic nerves continues to cause contraction of the muscles. From this it would follow that either the poison does not reach the nerve endings of the leg muscles when injected under the skin of the back, or that it does not paralyze them. Further investigations must be made before the conclusions of Messrs. Heckel and Schlagdenhauffen can be accepted, but they have introduced us to a substance which manifestly has most interesting pharmacological properties and may have important therapeutic uses.

D. J. Leech.

NOTES ON THE PREPARATION OF DRUG SECTIONS FOR MICROSCOPICAL EXAMINATION.[1]

BY F. ASHLEY ROGERS, Pharmaceutical Chemist.

It is to be regretted that the great majority of pharmaceutical students of botany and materia medica, do not prepare their own specimens for the microscope, but rely upon the professional microscopist, who is not always a botanist, and has been known to supply the aerial stem labelled root. It would certainly be much more satisfactory in every respect if pharmaceutical students prepared their own objects in the microscopical study of materia medica and structural botany, and I trust that these notes will show the simplicity of the operations and their inexpensive nature.

We may occasionally wish to prepare sections of fresh vegetable tissue. These cannot be cut until they have previously been hardened, which is accomplished by soaking for a week or ten days in pure methylated spirit, which should be frequently changed, say every twenty-four hours, until no color comes away from the tissues. They can now be preserved in spirit, and are always ready for making sections.

But more frequently our drugs are obtained dry, and very hard; they must then be softened by soaking in water with a little methylated spirit, or even soaking in hot water, or in a three per cent. solution of potash (where it can be safely done), that is in cases in which the cell contents, being injured, unfit the section for examination. Sections of soft stems, ovaries, etc., may be made by hand. Take the specimen between the thumb and fore-finger of the left hand, hold the finger horizontally so that its upper surface may form a table, on which the blade of a razor may slide, keep the handle of the razor in a line with the blade, and draw it from heel to tip through the specimen and towards yourself; keep the blade well wetted with very dilute spirit, and float off the sections as they are cut into a saucer of water.

The drug specimen is however frequently too hard for section cutting, by hand; it is then necessary to use a microtome. A very good one is that invented by Mr. Stirling. This is simply a brass well, into which fits a very finely cut screw. The instrument having been

[1] Read before the Chemists' Assistants' Association, London, Nov. 22, reprinted from *Phar. Jour. and Trans.*, Dec. 1.

firmly fixed to a table by means of another screw, the specimen is imbedded in a piece of carrot, or a mixture of lard and hard paraffin; the whole is put into the well, and as the screw is turned and gradually pushes out the whole of the contents of the well, sections are made with a razor or a section knife, which is nothing more than a large razor without a handle.

The knife and specimen should be kept well wetted with dilute spirit, and the sections may be kept until wanted in slightly diluted spirit. It is not necessary to use rectified spirit in section preparing, but the methylated spirit must not contain any kind of gum. A rough and ready test of the fitness of the spirit is to pour it into water; it should not affect the brilliancy of the water in the slightest degree.

For very friable tissues a special treatment is required. First soak the drug in strong alcohol, then it ether. Now prepare a solution of celloidin in equal parts of alcohol and ether, about the thickness of glycerin (reserve one-third of this solution). To one-third of this solution add its own bulk of alcohol and ether, in equal parts, and to the remaining one-third add twice its bulk of alcohol and ether in equal parts. Take the tissue out of the ether, and put into the thinnest of the above three solutions, for a few hours, then transfer to the thicker one for three or four hours, and lastly to the thickest for a day; take out and dry in the air and place in spirit until quite hard and opaque. It can now be easily cut.

The sections will be much more easily examined if they are stained one or more colors, and if they are to be stained they must usually be first bleached. First wash out the spirit by placing in water and then bleach by soaking in liq. sodæ chlorinatæ, B. P., for from two to ten hours. When all the color has disappeared from the sections wash them in water three or four times at least. They can now be kept in spirit until required. Judson's dyes were at one time used for staining these sections; but now specially prepared stains are more generally used, which can be bought, or made, if more than a very small quantity is required. For excellent recipes for such stains consult Bower and Vines "Practical Botany."

The spirit should first be washed out of the specimen. It should then be immersed in the staining fluid for from three to ten minutes, and washed in spirit for from ten to fifteen minutes. Lastly, the section, which now presents a dull appearance, is cleared by placing on

some clove oil until it sinks (usually in about five minutes); it will then be found to be quite clear, and is ready for mounting in Canada balsam, or more conveniently a mixture of Canada balsam and one-fifth its bulk of pure turpentine.

The brightness of a section stained with borax carmine is increased by placing in a mixture of spirit and one-sixth its bulk of hydrochloric acid for a minute or so. The acid must afterwards, of course, be thoroughly washed out.

If a section is overstained it may be remedied by placing in a dilute spirituous solution of hydrochloric acid or dilute aqueous solution of acetic acid according to the stain used.

Double staining is accomplished by using alkaline and acid solutions respectively; for example, green and red by first placing in an acid green solution, washing with water, and then placing in borax carmine solution, then wash in spirit and clear in clove oil.

Clove oil is a very good clearing medium and a very good vehicle in which to preserve the sections until required for mounting, if it is intended to mount them in Canada balsam. If a specimen is stained before it is sectionized it must, of course, be left in the stain hours, and perhaps days, instead of minutes; this is only done with soft tissues, such as ovaries, which should be gathered before they are quite ripe. Fresh stems should not be more than three years old as a general rule.

Sections must not be bleached where there are cystolithes or any other cell-contents which the bleaching fluid would dissolve. Certain resinous drugs, such as pellitory, must not be mounted in Canada balsam, which would dissolve out the resin; in such cases glycerin jelly containing carbolic acid, arsenic, or some other preservative, should be used. This is best used, not with a rod, but filtered while hot, and liquid through cotton wool directly on to the slide. To keep glycerin in is a very difficult matter. Gold size, which is at least ten years' old and quite "tacky," or sticky, is a very good cement, but it should be touched over about every five years.

Certain black cements are very liable to run into the Canada balsam and spoil the sections.

In conclusion, I would reaffirm that it is cheaper to make than to buy a good collection of drug sections, especially as many are only obtainable on the continent.

PHOTOGRAPHY.

BY F. V. BUTTERFIELD.[1]

With the exception of a short and succinct historical account, and a few necessary remarks on its relation to light and chemistry, I shall devote the best portion of this paper to the more important details and *modus operandi* of that branch popularly known as "amateur photography," so that any who are desirous of taking up this fascinating pursuit may be able to do so with, I hope, facility and ease. At the same time, however, others who cannot, for various reasons, take up the practice of photography for pleasure, or who rather choose to "scorn delights and live laborious days," will find, I am quite sure, a slight acquaintance with this subject either useful from a business, or interesting from a scientific point of view, for, disregarded as a work of art, but looking at it solely from a scientific standpoint a photograph may be considered simply as the result of a series of very delicate chemical reactions.

Boasting of barely half a century's existence, photography has made such rapid and gigantic strides that the position it holds to-day is one of the highest importance. Reverting to the details of its discovery we first of all find the old alchemists in the sixteenth century, whilst engaged in their mysterious craft, puzzling over the change they observed took place when silver chloride, or, as they termed it, luna cornua, was exposed to the light, and which, they eventually decided, must be due to a kind of transmutation of metals, a conclusion drawn very possibly, I think, from the philosopher's stone point of view, which when discovered would in some such simple manner "transmute" all the baser metals into gold.

The matter remains in *statu quo,* until another century "has dragged its slow length along," when history records that this phenomenon attracted the attention of one—Robert Boyle—the most learned philosopher of his time, and which he finally settled to his own satisfaction must perforce be caused by the action of the air, "sed de mortuis nil nisi bonum." He lived in dark days, when chemistry as a connected science could hardly be said to exist.

The question once more lapses for a long period into a state of quiescence, until at length Scheele, whose name is well known to all of you, appears upon the scene, deeply interested in and trying to solve this very problem, but although he succeeded in proving, by various means, that it was really owing to a reduction of the silver chloride, with partial loss of chlorine, his researches proved of little practical utility at the time.

Years roll on, iodine and bromine have both been discovered and found to give salts of silver much more sensitive to the light than the old chloride; in fact, on all hands we find the enthusiastic army of workers in this scientific research ever increasing and bringing matters gradually to a climax, which at last took place in 1839, a year ever memorable in the annals of photo-

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[1] Read before the Chemists' Assistants' Association, London, November 29th; reprinted from *Phar. Jour. and Trans.*, December 15th.

graphy as the period that marks its birth, and when Daguerre, a poor French painter, first exhibited to the gaze of an astonished world the great discovery which now bears his name, the daguerreotype, its appearance being warmly welcomed by the vast majority who saw at last a long felt want supplied, the very small minority consisting of those who gained a pittance by the art of miniature portrait painting, and to whom it was painfully apparent that their occupation had fled. The French government then granted the father of photography and his clever partner, Isidore Niepee, a pension, chiefly on the ground that "The invention did not admit of being secured by patent, since, as soon as published, all might avail themselves of its advantages; they therefore preferred to enjoy the glory of endowing the world of science and art with one of the most surprising discoveries that honor their native land."

In England, Wedgwood, bearing in mind the experience of Scheele with silver chloride, and assisted by Sir Humphry Davy, had been busily employed in conducting experiments at the Royal Institution with this substance; but, although he had actually succeeded in obtaining images, no method could, by any possible means, be discovered of "fixing" or making them permanent, so that, when exposed to the light, his pictures gradually faded from view.

Now, there is here real reason for regret, because a year or two later, before the discovery of the daguerreotype had taken place, Sir John Herschel first prepared and demonstrated the properties of hyposulphite, or more properly speaking, thiosulphate of sodium, particularly calling attention to the remarkable solubility of silver chloride in its solution. Here, then, was the very thing for which Davy had longed in vain, and it is now generally supposed that Herschel was ignorant of the results obtained and published a few years previously by Wedgwood and his illustrious assistant, Davy. Annother circumstance, perhaps still more remarkable, is, that even Daguerre, when he made his great discovery known, was not in possession of any perfect method of fixing his pictures, and it thus remained for Herschel to once more call attention to his discovery as the only means by which photographs on silver salts could be permanently "fixed."

Herschel, also, first suggested the use of glass plates, and his cyanotype is, even now, largely used by draughtsmen and others for taking copies of drawings, tracings, etc. In this process one side of a sheet of white paper is brushed over (in the dark or some non-actinic medium), with a solution made by dissolving 1 ounce each of potassium ferricyanide and ferric ammonium citrate in 8 ounces of water. When dry it is ready for use, and may then be exposed to a good light, beneath the subject to be copied, and afterwards "developed" by simply washing in plain water. During the process of printing the ferric salt is reduced to ferrous by the action of the light (in the presence of organic matter), and this at once combines with the ferricyanide present, to form ferrous ferricyanide or Turnbull's blue, which, being insoluble, is not affected by the subsequent washing in water, whilst the unchanged ferric salt is easily washed out, and thus an exact facsimile of the subject, be it negative, drawing or tracing, remains.

In 1841 Fox Talbot patented his famous calotype process. By it he obtained invisible images on paper, made sensitive with silver iodide, and developed them by means of a solution of gallic acid. Paper negatives, which at the present time, by reason of their light weight, compactness, etc., are promising to supersede those of glass, are thus by no means "new," another proof that there is nothing new under the sun. There is this difference, however, that the image was in the *texture* of the paper in Talbot's negatives, whilst now it is on the surface, so to speak.

But if photography was not originally given out to the world as the invention of one of perfidious Albion's sons—although at the same time, be it remarked, historians generally concede to Wedgwood the honor of having been the *first* photographer—we can console ourselves with the fact that, to a worker on this side of the silver streak, Scott Archer to wit, belongs the honor of having introduced the collodion process, as it exists to-day, and in importance his discovery certainly ranks next to that of the daguerreótype. As he had not taken out a patent for his process, and the best thanks of photographers are due to him for this, our Government granted at his premature death a pension to his bereaved family, because he had been "the discoverer of a scientific process of great value to the nation, and from which the discoverer had reaped little or no benefit."

His collodion process then came extensively into use, as the results obtained by it, for studio work in general and portraiture in particular, were vastly superior to those of the daguerreotype. The substitution of glass for metal as a substratum was also a step in the right direction.

But even here photographers did not by any manner of means rest contented, for we find that a grand improvement was soon to take place in the introduction of gelatin as a substitute for the use of collodion, first proposed, after satisfying himself with experiment, by Dr. Maddox, and made practically and commercially successful by Mr. Kennet, of, strange to say, Maddox street.

Thus, speaking generally, we have at present three chief photographic processes, the daguerreotype, the collodion, and the one just mentioned, or the gelatin-bromide process.

The daguerreotype is still occasionally preferred for some special kinds of work, and the collodion process has its advantages, particularly in the production of "positives," but the introduction of the rapid gelatin dry plate, devoid of all the "messiness" of the old wet process, may fairly be said to have called the amateur photographer into existence and made him a striking feature of the nineteenth century.

The daguerreotype consists of a copper plate, which is first coated on one side with a very thin coat of metallic silver by electro deposition and then submitted to the combined action of bromine and iodine, thus forming silver bromo-iodide, a combination which has been proved by experiment to be much more sensitive to light than either of the separate single salts.

After exposure in the camera, the photographic image is developed by means of metallic mercury vapor, usually performed by heating a layer of mercury to about 150° Fahr., and suspending the plate over it, in the dark,

or some non-actinic medium, of course, then finally fixed by a solution of thiosulphate of sodium.

Now, as regards the chemistry of this process, the first question that naturally presents itself is, What important change does the light produce on the sensitive surface of silver haloid salts when exposed to its influence? You will at once remember that this is the very problem Scheele tried so hard to solve, and to-day, although a century after, we have not yet arrived at a clear solution. This is possibly little matter for surprise when we consider that, to begin with, we do not know what light itself really is. Some theorists even argue that the light does not produce any chemical decomposition whatever, but merely a physical change. The accepted theory, however, appears to be, and it receives the support of our best authority—Captain Abney—that a subsalt is formed thus:

$$Ag_2I_2 + \text{light} = Ag_2I + I,$$

the free iodine combining with excess of silver present to form more silver iodide.

But then, on the other hand, no one has ever yet prepared a definite chemical compound of silver with any of the halogens, containing *less* of the latter than the ordinary chloride, bromide or iodide, and so the matter remains.

Accepting the subsalt theory, then, the development of the latent or photographic image is apparently due to the attraction of the sub-iodide for the mercury-vapor, the resulting visible image consisting of a white amalgam of mercury and silver, whilst in the process of "fixing" the thiosulphate simply dissolves away the unaltered iodide by forming a soluble double salt thus:

$$2AgI + 3Na_2S_2O_3 = Ag_2Na_4(S_2O_3)_3 + 2NaI.$$

Turning to the collodion process we find *glass* plates are used, coated on one side with collodion, containing in its solution a bromide and iodide, usually ammonium iodide and cadmium bromide, and as soon as it is "set," they are sensitized by immersion in a bath of silver nitrate, when double decomposition of course takes place in the film, silver bromide and iodide being formed. Whilst still in this moist state, they are exposed in the camera and, after exposure, a solution of ferrous sulphate, with the addition of a little acetic acid and alcohol, is used for their development; the reactions that take place whilst developing being oxidation of the ferrous salt to the ferric, and consequent reduction of the silver salts to the metallic state, the latter remaining insoluble in the film, and constituting the image, the acid contained in the developing solution merely acting as a restrainer to prevent the too rapid reduction of the silver salt, whilst the alcohol simply exercises a mechanical action in causing the solution to flow more evenly over the plate.

The reaction would, I think, be expressed by the following equation:

$$6Ag_2Br + 6FeSO_4 = Fe_2Br_6 + 2(Fe_23SO_4) + 12Ag.$$

After washing they are then "fixed" by means of a solution of "hypo," which, as before, merely dissolves out the unaltered iodide and bromide of silver.

(*To be continued.*)

MINUTES OF THE PHARMACEUTICAL MEETING.

PHILADELPHIA, December 18, 1888.

The meeting was called to order and Mr. Wm. McIntyre was asked to preside. The minutes of the last meeting were read and approved.

Professor Trimble stated that at the last meeting of the College Committee upon revision of the pharmacopœia the question of the strength of *bleaching powder* was discussed, and it was thought by some that the statement of our standard was much lower than the character of the chlorinated lime of commerce warranted. Mr. H. J. M. Schroeter, a post graduate of our School, at Professor Trimble's suggestion, made a number of determinations of the amount of chlorine in various lots he had obtained from various stores, and found an average would be rather over twenty-nine per cent; he read a paper giving the results of his assays.

Professor Maisch stated that while this subject was under consideration in the Revisional Committee it was well known that much stronger chlorinated lime could be obtained in large quantities; but it was thought best to adopt a minimum percentage of 25 because the substance was quite liable to lose chlorine and such a grade could be readily secured by the pharmacist. Prof. Maisch inquired if that contained in small packages was uniform in strength and as strong as that taken from the large casks; the article imported in the casks was very well preserved.

Mr. Meyer asked if the sales of chloride of lime were not less than formerly. He was of the opinion that it was; but several thought that the sales were more frequent. It was stated that all chorinated lime consumed here was of foreign manufacture as the black oxide of manganese of American origin is inferior to that which is imported. A query was put whether the manganese ores were contaminated with cobalt; to this answer was made that they were rarely found together.

Mr. England read a paper upon a *permanent syrup of hydriodic acid.* Professor Maisch asked Mr. England if he had tested the pharmacopœial syrup for glucose; he said that he had not done so. Mr. Beringer said he had made syrup of hydriodic acid by the double decomposition of potassium iodide and crystallized tartaric acid, but that he had added some sugar to the solution of potassium iodide to prevent change, and he found the syrup had kept well since August, 1887.

Professor Trimble reminded the meeting that last month he read a paper upon a berry used as food. At this meeting he would call attention to a root, which was largely used for nutrient purposes, obtained from *Lewisia rediviva.* It was generally stripped of its bark and contained a large amount of mucilage.

Mr. McIntyre remarked that as some of the members were going to cross the Rocky mountains for the next meeting of the American Pharmaceutical Association, they should bear this root in mind; if they should run short of provisions and had to forage it would be a novel experience.

Mr. England inquired about the *loco-weed* of the Western States; some parties had stated that it was particularly poisonous to cattle, while others

thought such was not the case. Prof. Maisch stated that the experiments upon the subject made by preparing infusions, tinctures and extracts failed to show any specially poisonous properties, and Professor Sayre had been unable to find in the plant any deleterious principle; but the physiological experiments had been made upon carnivorous and omnivorous and not with herbivorous animals. The American loco weeds were species of the genera astragalus and oxytropis, and were botanically closely rlated to the shrubs of Western Asia yielding tragacanth.

Mr. G. M. Beringer read a paper upon the *Hungarian Daisy*, an importation of which had been made into New York, and which was likely to be used as an adulteration of the insect powder. Prof. Maisch suggested that since the microscope seemed to afford no reliable criterion for the detection of such an adulteration in insect powder, the percentage of alcoholic extract and of ash, as determined by Mr. Beringer, might be made available for this purpose.

The papers read, having been referred to the Committee on Publication, there being no further business, the meeting adjourned.

T. S. Wiegand,
Registrar.

PROCEEDINGS OF STATE PHARMACEUTICAL ASSOCIATIONS.

The following printed Proceedings have been received of meetings which have been previously reported in the last volume of the Journal:

Illinois.—Pp. 207. See November number, 1888, p. 587.

Massachusetts.—Pp. 225. See July number, 1888, p. 377.

Minnesota.—Pp. 140. See August number, 1888, p. 425.

Missouri.—Pp. 238. See August number, 1888, p. 426.

South Dakota.—Pp. 82. See November number, 1888, p. 587.

Wisconsin.—Pp. 72. The meeting was held at Palmyra Springs, August 7–10th, president Pulford in the chair. The president's address, the reports of officers and various committees, and eight essays on different subjects claimed the attention of the meeting. The officers for the present year are J. C. Huber, Fond du Lac, president; H. Rollman, Chilton, and F. W. Isham, Elkhorn, vice-presidents; E. B. Heimstreet, Janesville, permanent secretary; W. P. Clarke, Milton, treasurer; W. M. Edwards, Portage, local secretary. The tenth annual meeting will be held at Portage during the second week in August next, commencing Tuesday and lasting three days.

EDITORIAL DEPARTMENT.

The new volume of the Journal, commencing with the present number, bears upon its title page—in addition to the names of the members of the Publishing Committee, under whose supervision the Journal has been issued since the death of Professor Procter in February, 1874—also the names of a

number of gentlemen well known to the pharmacists of the country, who as "collaborators" will hereafter identify themselves with the Journal even more closely than in the past.

In closing the eighteenth year as occupant of the editorial chair and the thirty-fifth year as one of the contributors to the pages of the Journal, the Editor desires to thank his many friends for their uniform courtesy in the past, and with his best wishes towards all at the beginning of the present year, to request a continuance of their favorable interest in the Journal.

The next meeting of the American Pharmaceutical Association.—We are informed by the chairman of the Committee on Arrangements, Prof. Emlen Painter, New York, that the Committee has not made, or authorized the publication of any statement concerning arrangements for the trip to California. The date of the meeting has not yet been fixed, but will probably be either June 24th or July 15th, and members are requested to communicate their preference to the chairman without delay. It is contemplated to give a through rate at the least possible expense, and to make the side excursions entirely optional. The announcement of the date and of the plan for the trip to California will be communicated, over the signatures of the Committee, in time for publication in the February issues of the Pharmaceutical Journals.

The Manufacture of Fuid Extracts by Retail Pharmacists is the theme upon which essays have been invited by the Anderson Manufacturing Company, Detroit, Michigan. The essays are not to exceed in length 1000 words, and are to be sent by March 1st next to P. O. box 134, Detroit. It is expected that the professional as well as the financial advantage of such manufacturing be discussed, and that as much as possible the results obtained in actual work be given, and not mere theorizing or excerpts from the work of others. A committee of three pharmacists will decide upon the merits of the essays received, and award the two prizes, consisting of percolation apparatus.

Rewards for meritorious discoveries and inventions.—The Franklin Institute of the State of Pennsylvania, through its Committee on Science and the Arts, is empowered to award, or to recommend the award of, the following medals:

1. The Elliott Cresson Medal (gold), founded by legacy of Elliott Cresson, will be granted for the invention or improvement of some useful machine, or for some new process, or combination of materials in manufactures, or for ingenuity, skill or perfection in workmanship.

2. The John Scott Legacy Premium and Medal ($20 and a medal of copper) originated from a bequest made in 1816 by John Scott, a merchant of Edinburgh, Scotland, to the city of Philadelphia, for rewarding ingenious men and women who make useful inventions.

Upon request therefor, from interested parties, made to the Secretary of

the Franklin Institute, at Philadelphia, full information will be sent respecting the manner of making application for the investigation of inventions and discoveries; furthermore, the Committee on Science and the Arts will receive and give respectful consideration to reports upon discoveries and inventions, which may be sent to it with the view of receiving one or the other of the awards herein-named, and full directions as to the manner and form in which such communications should properly be made, will be sent on application.

The Universal Exposition of 1889 *at Paris*, France, will open May 5th, and close October 31st; and goods for exhibition will be received from January 1st to March 31st. The United States Commission, having its home office at No. 1 Broadway, New York, and its Paris office at No. 27 Avenue de la Bourdonnais, will forward free of freight between New York and the Exposition, going and returning, all articles received for exhibit.

The classes in which pharmacists and druggists are specially interested are in group II.: 8. Organization, methods and appliances for higher instruction; 12. photographic proofs and apparatus; 14. medicine and surgery; veterinary and comparative medicine; 15. instruments of precision. In group III.: 28. perfumery. In group V.: 45. chemical and pharmaceutical products; 46. chemical methods of bleaching, dyeing, printing and finishing. In group VI.: 51. apparatus used in chemistry, pharmacy and tanning. In group VII.: 67. cereals; farinaceous products with their derivatives.

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

Several important works remain upon the Editor's table, for the review of which we hope to make room in our next issue. The following reports, essays and periodical publications have been received:

The Physician's Visiting List (Lindsay & Blakiston's) for 1889. Philadelphia: P. Blakiston, Son & Co.

The one before us is the thirty-eighth annual issue.

Methods of Analysis of Commercial Fertilizers, Cattle Food, Dairy Products, Sugar and Fermented Liquors; adopted at the fifth annual convention of the Association of Official Agricultural Chemists, held at the U. S. Department of Agriculture, August 9 and 10, 1888. 8 vo., pp. 96.

This is Bulletin No. 19, Division of Chemistry.

Vergleichung der wichtigsten narkotischen Extracte. Inaugural-Dissertation von Richard Kordes.

A resume of Mr. Kordes' work upon the narcotic extracts was given in our last volume pp. 402, 452, and 559.

Beiträge zur Toxikologie des Ortho-und Para-Toluidin. Inaugural-Dissertation von B. A. Treitenfeld, Dorpat. 8 vo., pp. 37.

Contributions to the toxicology of ortho-and para-toluidin.

Compendium of the Laws Relating to Public Health and Safety of the State of Pennsylvania, together with the decisions of the Supreme Court and County Courts relating thereto. Compiled for the State Board of Health, Harrisburg. 8 vo., pp. 174.

Report of the Pennsylvania State College for the year 1887. Part II. Agricultural Experiment Station. 8 vo., pp. 226.

Mineral and Thermal Springs of California. By W. F. McNutt, M. D., etc.

From the Transactions of the Ninth International Medical Congress. Vol. V.

Below Sea-Level; nature's pneumatic cabinet; and *High Altitudes of Southern California.* By Walter Lindley, M. D., Los Angeles.

Two papers on the extremes in altitude in Southern California, reprinted from the *Medical Record,* and *Southern California Practitioner.*

The preferable climate for Phthisis, or the comparative importance of different climatic attributes in the arrest of chronic pulmonary diseases. By Chas. Denison, A. M., M. D., &c., Denver.

From the Transactions of the Ninth International Medical Congress, Vol. V.

Writing Machines for Doctors. By John Aulde, M. D.; reprint from The Medical Register, Philadelphia.

A new Antiseptic. By D. W. C. Wade, M. D., Holly, Michigan.

The antiseptic recommended is *aluminium sulphite.*

The failure of Dr. J. B. Thomas' Treatment of Urethral strictures by electrolysis. By Rob. Newman, M. D., New York.

From the Journal of the American Medical Association.

Displacements of the Uterus; together with formula for official dilute hydrobromic acid, U. S. P. By DeWitt C. Wade, M. D., Holly, Michigan.

From the Transactions of the Ninth International Medical Congress, Vols. II. III.

Is the average Dentist of to-day a specialist in medicine? By B. H. Catching, Louisville, Ky.

Address delivered before the joint meeting of the American and Southern Dental Associations.

Zusammenstellung der Arbeiten über das Antipyrin.

Compilation of the papers on antipyrine.

A digest of the more important publications on Sulfonal-Bayer.

Phenacetine-Bayer (Para-Acetphenetidine).

The above three pamphlets contain resumes of most publications relating to the properties of the three chemical specialties named in the titles. The last two are published by W. H. Schieffelin, & Co., New York.

Transactions of the American Association of Obstetricians and Gynecologists at the first annual meeting, held in Washington, D. C., Sept. 18, 19 and 20, 1888. Abstract. 8vo. pp. 38.

Reprint from the Buffalo Medical and Surgical Journal.

Second Annual Report of the State Board of Health and Vital Statistics of the Commonwealth of Pennsylvania. Transmitted to the Governor December 1, 1886. Harrisburg. 8vo. pp. 1056.

The publication of the first annual report of this Board was noticed on page 622 of our volume for 1886. The publication of the volume now before us was delayed in consequence of the printing of the reports of other departments having been previously authorized by the Legislature and therefore, taken precedence.

The report of the Secretary, Dr. Benj. Lee, and the minutes of the Board occupy only a small portion of this stately volume. By far the greater portion is taken up by special reports, essays, statistics, etc., all of which appear to have been prepared with much care. Thus we find reports on water supplies and drainage of different localities; on local epidemics and special sources of disease; on quarantine and disinfection; mortuary tables; various legal proceedings; an account of the State Sanitary Convention, with the papers read before that body; the proceedings of the National Conference of State Boards, etc.

The care bestowed upon the preparation of this volume reflects credit upon the Board and its secretary, and it is to be hoped that in the future the Legislature may, more promptly than heretofore, take action for the early publication of such reports.

CLASSES

—OF THE—

PHILADELPHIA COLLEGE OF PHARMACY,

SIXTY-EIGHTH ANNUAL SESSION, 1888-1889.

JUNIOR CLASS.

Name.	*Place.*	*State.*	*Preceptor.*
Alsentzer, Chas. Frederick,	Wilmington,	Del.	F. R. Smith.
Adams, Franklin Irving,	Amsterdam,	N. Y.	J. H. Barkhuff, Ph. G.
Allen, Bert William.	Groton,	N. Y.	C. Shivers.
Angeny, Ferdinand Gisler,	Doylestown,	Pa.	Harland Cloud, Ph. G.
Appel, Albert Alphonso,	Hamburg,	Germ'y.	G. W. Goldsmith.
Apple, Franklin Muhlenburg,	Bangor,	Pa.	M. L. Apple.
Appman, William,	San Antonio,	Tex.	F. Kalteyer & Son.
Armstrong, Eugene Curtis,	Chester,	Pa.	A. Steen Buchanan.
Bacon, Henry Augustus,	Burlington.	N. J.	H. B. Weaver, Ph. G.
Barnard, Wm. Dwight,	Manistee,	Mich.	A. H. Lyman.
Barwig, Gustavus Adolphus,	Philadelphia,	Pa.	Dr. G. A. Bachman.
Baskin. Mortimer Horning,	Harrisburg,	Pa.	M. H. Bickley.
Bast, Charles Lewis,	Baden,	Germ'y.	N. A. Cozens, Ph. G.
Behm, John Strickler,	Derry Church,	Pa.	James Buckman, Ph. G.
Belt, James Ferris,	Wilmington,	Del.	Z. James Belt.
Besore, Abraham Lincoln,	Shippensburg,	Pa.	W. D. E. Hayes.
Bilderback, Joseph Brown,	Pennsgrove,	N. J.	Dr. M. Johnson.
Blackwood, Russell,	Bristol,	Pa.	J. R. Smyser, Ph. G.
Bloor, Frank William,	Mansfield,	Ohio,	McCullough & Caldwell.
Böcking, Guido Carl,	Tyrone,	Pa.	Sam'l Gerhart, Ph. G.
Bonnell. Alex. Carhart,	Clinton,	N. J.	B. F. Severs, M. D.
Bowman, Fred Kyle,	Decatur.	Ill.	G. W. Thompson.
Bowman, George McLeod,	Bridgeton,	N. J.	C. B. Bellows, Ph. G.
Bowman, John McLaughlin,	Philadelphia,	Pa.	F. W. Heyl, Ph. G.
Bradbury, Wymond H.	Hammondton,	N. J.	A. W. Cochran.
Breidinger, Lewis Abraham,	Easton,	Pa.	C. E. Hewitt. Ph. G.
Breisch, William H.	White Haven,	Pa.	C. M. Driggs.
Brittain, John,	Butler,	Pa.	J. C. Redick.
Brown, Charles,	Philada.,	Pa.	W. J. Pechin.
Brown, Thomas Edward,	Seaford,	Del.	P. W. Tomlinson, M.D.
Buehl, Edward Hermann,	Massillon,	Ohio.	E. S. Craig, Ph. G.
Bugg, Zack W.,	Blandville,	Ky.	S. J. Coffee, Ph.G.
Burgess, Ellis Beaver,	Pittsburg,	Pa.	D. C. Aughinbaugh.
Burgess, Frank Eugene,	Jefferson,	Ohio.	E. H. Evans.
Cadmus, Alfred Brooks,	Philada.,	Pa.	Bullock & Crenshaw.
Caffrey, James Peter,	Wilkesbarre,	Pa.	F. F. Donnell.
Carney, George Elmer,	Philada.,	Pa.	Hance Bros. & White.
Carriat, Louis Michael,	Egg Harbor City.	N. J.	
Carter, James Royal,	Lincoln.	Neb.	Zehrung & Dunn.
Casey, Harry English,	Philada.,	Pa.	Bullock & Crenshaw.
Chapman, Mrs. Emily J.,	Philada.,	Pa.	W. C. Sparks.

Name.	*Place.*	*State.*	*Preceptor.*
Christman, Albert S.,	Allentown,	Pa.	E. J. Danowsky.
Coleman, Samuel,	Harrisburg,	Pa.	Dr. L. A. Dix.
Cook, Francis Wade,	Royersford,	Pa.	M. H. Bickley.
Cornogg, Samuel Sharpless,	Ward,	Pa.	L. C. Buckley.
Craig, Cornelius Abernathy,	Pulaski,	Tenn.	Craig & McLemore.
Crothers, James Lawson,	Zion,	Md.	W. H. Lantz.
Cullen, James Kimmey,	Camden,	Del.	F. H. Davis.
Dalton, David,	Upland,	Pa.	E. A. Trist, Ph.G.
Dalton, William Spencer,	Highpoint,	N. C.	Porter & Dalton.
Davis, Alvah Molony,	Norristown,	Pa.	E. A. Stahler,
Deibert, Wm. Henry,	Stemton,	Pa.	Harry Swain, Ph G.
Dennison, Jr., Edward Lyman,	Marion,	Ill.	E L. Dennison, M. D.
Devine, Oliver Crawford,	Philada.,	Pa.,	D. McVicker.
Dewees, Jacob Highley,	Norristown,	Pa.	Wm. Stahler.
Dice, Will,	Mansfield,	Ohio,	W. M. Barton.
Dieroif, Charles B.,	Mount Joy,	Pa.	Dr. J. F. Meade.
Dillon, Jr., Thomas Henry,	Philada.,	Pa.	Dr. Jos. Malatesta, Ph.G.
Dubbs, Robert Lorine,	Allentown,	Pa.	L. Murjahn.
Duff, Peter Nicholas,	Philada.,	Pa.	S. Campbell, Ph.G.
Dunning, Fred,	Denton,	Md.	E. Q. Thornton.
Dunwiddie, Wm. Arthur,	Phillipsburg,	Pa.	J. M. George.
Dunwody, Richard Gaillard,	Brunswick,	Ga.	Dr. J. A. Dunwody.
Eberhardt, Wm. Frederick,	Fond du Lac,	Wis.	Ditter, Mitchell & Co.
Eby, Edwin Stanton,	Newport,	Pa.	B. M. Eby.
Eckels, Chas. Alfred,	Mechanicsburg,	Pa.	H. S. Eckels, Ph.G.
Elliott, Arthur Hugh,	Mansfield,	Pa.	C. V. Elliott, M. D.
England, Wm. Taws,	Philada.,	Pa.	R. England, Ph G.
Eppley John Hake,	York,	Pa.	W. K. Mattern, M. D., Ph.G.
Evans, Paul Whiting,	Malvern,	Iowa,	Munger & Goodwin,
Eyer, Harvey Bowman,	Everett,	Pa.	C. G. Masters.
Feidt, George David,	Hagerstown,	Md.	H. H. Ross.
Flemming, Thomas Francis,	Reading,	Pa.	Ziegler & Smith,
Fletcher, Tom Milton,	Little Rock,	Ark.	W. H Haliburton.
Flora, George Elwood,	Bangor,	Pa.	Dr. J. Buzzard.
Fraunfelder, Richard Deily,	Easton,	Pa.	Dr. T. N. Reeser.
French, Adelbert Porter,	Susquehanna,	Pa.	H. E. Outwater.
Frontz, Edward Elmer,	Hughesville,	Pa.	W. C. Stillwell, M. D., Ph.G.
Garcia, Juan Reyes,	Porto Rico,		R. C. Martin.
Garland, John Kisler,	Scranton,	Pa.	N. G. Ritter, Ph. G.
Geilfus, Alfred Victo,	Philadelphia,	Pa.	F. T. Williams, Ph. G.
Gervais, Wm. Joseph,	Elmira,	N. Y.	J. R. Angney, M. D.
Gibble, Elmer Ellsworth,	Manheim,	Pa.	J. Howard Evans.
Gibbony, David Clarence,	Lisbon,	Iowa,	S. Kittering.
Gibson, Robert,	Shepherdstown,	W. Va.	O. H. Musser, Ph. G.
Gonzales, José Antonio,	Cucuta,	Columbia, S. A.	
Gordon, Jean,	Cincinnati,	Ohio.	Dr. S. Hayhurst.
Gosh, Wm. Edgar,	Danville,	Pa.	W. E. Meck.
Gottwerth, Wm. Louis,	Wilmington,	Del.	T. B. Cartmell.
Gotwalt, Sam'l. Horace,	York,	Pa.	J. H. Stermer, Ph. G.
Graham, Harry Clyde,	Waterbury,	Ct.	J. M. Hillan.
Griffith, Joseph Thomas,	Sassafras,	Md.	F. E. Harrison, Ph.G.
Groody, Thomas Joseph,	Centralia,	Pa.	J. M Hillan.
Guest, Harry,	Sweedesboro,	N. J.	C. C. Hughes.
Hackenberger, G. Washington,	Bainbridge,	Pa.	H. C. Blair's Sons.
Hæberle, Louis Philip,	Philada.,	Pa.	A. Hohl, Ph. G.
Hall, Thomas Murphy,	Middletown,	Del.	H. Knight, Ph. G.
Hamberg, Samuel T.,	Pittsburg,	Pa.	J. F. Judd.
Hand, Harry Cobb,	Cape May, C. H.,	N. J.	
Hanson, Arthur Edward,	Rio Janeiro,	Brazil,	J. J. Ottinger, Ph. G.
Harbold, Curtis Alexander,	York,	Pa.	J. M. Ruegenberg.

Name.	*Place.*	*State.*	*Preceptor.*
Harris, William Petriken,	Mill Hall,	Pa.	W. J. Shoemaker.
Hasson, Henry Decora,	Philipsburg,	Pa.	D. H. Ross, Ph. G.
Haydock, Susannah Garrigues,	Philada.,	Pa.	S. Hayhurst, M. D.
Hendrickson, Chas. Palmatary,	Dover,	Del.	J. H. Buckingham, Ph.G.
Henkel, Luther Samuel,	Catawissa,	Pa.	E. H. Baker, Ph. G.
Hennessy, Frank Augustine,	Charlotte,	Mich.	H. K. Mulford, Ph. G.
Herbein, George Winters,	Sinking Springs,	Pa.	H. G. Haring.
Herr, Henry Eastburn,	Masonville,	N. J.	H. A. Borell, Ph. G.
Hickman, Thomas Elwood,	Lombard,	Md.	W. H. Hickman, M.D.
Hills, Daniel Henry,	Jamestown,	N. Y.	Wilmot Hansell.
Hood, John Ezekiel,	Smithfield,	N. C.	T. R. Hood.
Hornby, Walter Melvin,	Roxborough,	Pa.	H. H. Anderson.
Hurxthal, Henry Lewis,	Massillon,	Ohio.	E. A. Richmond, Ph.G.
Irvin, James Scales,	Reidsville,	N. C.	Irvin Bros.
Jackson, Henry Spencer,	Barnsley,	Pa.	Dr. C. P. Jackson.
Jacob, Walter William,	West Grove,	Pa.	Genois & Laubach.
Janson, Edwin Leonard,	Canton,	Ohio,	Weber Bros.
Johnson, Wm. Anthony,	Philada.,	Pa.	E. Jungmann, Ph. G.
Karcher, James Daniel,	Millville,	N. J.	Dr. T. C. Wheaton.
Keim, Albert Frederick,	Chillicothe,	Ohio,	J. A. Nipgen.
Keller, Benjamin C.,	Manchester,	Iowa,	L. Atwater & Son.
Keppler, Charles Lewis,	New Orleans,	La.	C. L. Keppler.
Ketterer, Martin,	Philada.,	Pa.	J. C. Phillips.
Kitzmiller, Frank Kurtz,	Harrisburg,	Pa.	M. Campbell, Ph. G.
Kogelschatz, John Wm.,	Martinsburg,	W. Va.	J. Barclay Hall.
Koons, Milton Henry,	Catasauqua,	Pa.	E. D. Boyer. Ph. G.
Krauss, Frederick,	Philada.,	Pa.	Geo. Bille, Ph. G.
Kunkle, Wm. Henry,	Salladasburg,	Pa.	W. E. Kunkle.
Laessle, Henry Adolph,	Philada.,	Pa.	Dr. F. Seitz.
Lammer, Jacob Sigmund,	Philada.,	Pa.	Bullock & Crenshaw.
Landis, Charles Paul,	Philada.,	Pa.	Chris. Petzelt.
Landis, Gilbert Cromie,	Camden,	N. J.	F. Phillips.
Landon, Francis P.,	Wilmington,	Del.	F. W. Fenn.
Lefferts, Henry Tomlinson,	Southampton,	Pa.	Given & Co.
Leigh, Charles Neal,	Coxsackie,	N. Y.	H. C. Manlove.
Lingle, Milton David,	West Hanover,	Pa.	Dr. W. C. Kline.
Linsz, Henri Philip,	Tioga,	Pa.	
Lippen, Jonathan Knight,	Salem,	N. J.	H. M. Levering, Ph.G.
Lisenring, Gibson Harry,	Chester,	Pa.	J. F. Fielding.
Lloyd, James E.,	Northumberland,	Pa.	Dr. W. L. Palmer.
Loelkes, Alexander George,	Belleville,	Ill.	Aschenbach & Miller.
Loesch, William,	Philada.,	Pa.	W. E. Lee, Ph. G.
Long, Christian Leitner,	Shippensburg,	Pa.	T. E. Conard, M. D.
Lutz, Irwin Breneman,	Blainesport,	Pa.	C. M. Steinmetz, Ph.G.
Lutz, Wm. Dellet,	Germantown,	Pa.	L. A. Treichler.
McAniff, Hugh Phillips,	Wilkesbarre,	Pa.	Joseph Hart.
McArthur, Edward Duncan,	Georgetown,	Col.	
McClellan, Howard,	Cambridge,	N. Y.	H. G. South.
McClure, Linwood Dunham,	Philada.,	Pa.	Budd Butterworth & Co.
McCorkle, Wm.,	Philada.,	Pa.	H. Moll & Co.
McCullough, Madison Lovett,	Oxford,	Pa.	C. B. McCullough.
McDonald, Claud Duval,	Norfolk,	Va.	W. F. Phillips.
Mackey, Edward Scudder,	Belvidere,	N. J.	Faust Bros.
McNabb, Henry Steel,	Belleville,	N. J.	J. T. Shinn, Ph. G.
Marvill, Joseph Howard,	Philada.,	Pa.	J. F. Yealy, Ph. G.
Mayes, Thomas Enoch,	Lewistown,	Pa.	J. A. Muthersbough, Ph.G.
Mentzer, Harlan Joseph,	Waynesboro,	Pa.	T. L. Buckman, Ph.G.
Meyers, Louis,	Conshohocken,	Pa.	C. Moylan.
Meyers, Quillas Albert,	Petersville,	Pa.	Stewart M. Hohl.
Miller, Frank,	Danville,	Pa.	W. E. Meck.

Name.	*Place.*	*State.*	*Preceptor.*
Miller, William Edward.	Camden,	N. J.	H. W. Miller.
Miller, William Haman,	Dover,	Del,	S. D. Marshall.
Milliken, William Houston,	Philada.,	Pa.	H. S. Eckels, Ph. G.
Moon, Joakin Richard.	Morrisville,	Pa.	F. C. Pryor.
Moore, Wm. David,	Connellsville,	Pa.	J. C. Moore.
Morales, Guadalupe,	Nicaragua,	C. A.	D. Morales.
Morrison, John William,	Amherst,	N. S.	R. C. Fuller.
Moylan, Wm. Henry,	Philada.,	Pa.	T. C. Tomlinson.
Mueller, Charles August,	Philada.,	Pa.	A. G. Keller, Ph. G.
Mulheron, John Dunaway,	Brownsville,	Tenn.	J. H. Owen.
Mustard, Frank Haveling,	Philada.,	Pa.	H. F. Roades.
Myers, William Tice,	Myerstown,	Pa.	C. C. Hagenbuch.
Newton, Alexander Bunyan,	Philada.,	Pr.	J. L. Kooker, Ph. G.
Nickum, Elwood George,	Bethlehem,	Pa.	C. B. Lowe & Co.
Odbert, James Henry,	Wheeling,	W. Va.	A. T. Young
Outen, Albert Pettit,	Philada.,	Pa.	Danl. Follmer.
Pazmino, Francisco,	Machala,	Ecuador, S. A.	
Peacock, Josiah Comegys,	Millington,	Md.	J. W. Kohlerman, Ph.G.
Pentz, John Fleming,	Easton,	Pa.	H. B. Sample & Son.
Perkins, John Seymour,	Clarksville,	Tenn.	Asken & Edwards.
Perry, John Conrad,	Philada.,	Pa.	John Roper.
Pfromm, Geo. Washington,	Philada.,	Pa.	D. S. Wiltberger.
Phipps, Amos Joseph,	Chestnut Hill,	Pa.	F. H. Poley.
Plass, Hermann.	Germantown,	Pa.	M. Kratz. Ph. G.
Platt, George Fisk	Chambersburg,	Pa.	H. A. Newbold, Ph. G.
Prass, John Nicholas,	Dayton,	Ohio,	W. H. Hyers,
Pratt, Wm. Henry,	Camden,	N. J.	Lewis H. Wilson.
Prior, Edwin Alfred,	Williamsport,	Pa.	M. Huber.
Prizer, Sue Ada.	Pottstown.	Pa.	Dr. Roney.
Procter, James Elliot,	Wooster,	Ohio,	A. W. Blackburn.
Rasmusen, Otto,	River Falls,	Wis.	C. E. Davis.
Raub, Fred Miller Dickson,	Lancaster,	Pa.	Dr. M. W. Raub.
Reese, David John,	Scranton,	Pa.	C. Carroll Meyer, Ph. G.
Reizenstein, Albert George,	Lebanon,	Pa.	Dr. Geo. Ross & Co.
Remington, Samuel Jacobs,	Philadelphia,	Pa.	Stryker & Ogden.
Rhodes, Charles Reynolds,	Orrstown,	Pa.	W. H. Faunce Ph. G.
Richardson, Harry,	Dover,	Del.	C. E. Hewitt, Ph. G.
Richardson, James Henry,	Charlestown,	Md.	Dr. L. R. Kirk.
Rohrer, Howard,	Lancaster.	Pa.	H. B. Cochran.
Rolph, Wilbur Hamilton,	Church Hill,	Md.	Lee Roberts.
Ross, Evan Jackson,	Phœnixville,	Pa.	Geo. Cooke.
Ross, H. Frank,	Russellville,	Pa.	T. G. Pierce.
Roth, Theodore Wm.	Philadelphia,	Pa.	Dr. G. H. Ischler.
Rue, Louie Evans,	Danville,	Ky.	Caldwell & Eastland.
Ruff. U. Gilbert,	Bryansville,	Pa.	J. H. Munson, Ph. G.
Sample, Joseph Frank,	Mechanicsburg,	Pa.	J. H. Shelly.
Sanborn, Francis P.,	Wilmington,	Del.	F. W. Finn.
Schade, George Julius,	Sandusky,	Ohio,	O. F. Johnson.
Scheirer, Franklin Benjamin,	Hokendauqua,	Pa.	F. N. Green.
Scheirer. Victor Daniel,	Allentown,	Pa.	Weber & Good.
Scherer, Bernhard Frederick,	Philadelphia,	Pa.	C. E. Haenchen.
Schick, Frederick Martin,	Bellair,	Ohio,	J. D. Van Law.
Schoff, Jacob John,	Annapolis,	Md.	G. B. Evans, Ph. G.
Schraedley, Fred'k Abraham,	Locust Dale,	Pa.	Bullock & Crenshaw.
Schultz, Albert,	Scranton,	Pa.	T. D. Lewis.
Seler. Charles Augustus,	Allentown,	Pa.	D. Heistand.
Shaffer, Samuel Albert,	Lock Haven,	Pa.	G. W. Mason.
Sheafer, Edward Parke,	York,	Pa.	J. L. Supplee, Ph. G.
Sheehan, John Peter,	Utica	N. Y.	W. R. Jones.
Shimer, Edwin Babp,	Stockerton,	Pa.	Dr. Fetterolf.

Name.	*Place.*	*State.*	*Preceptor.*
Shivers, Stockton Spicer,	Camden,	N. J.	Dr. C. L. Mitchell.
Shomberg Albert Frederick,	Altoona,	Pa.	G. A. Beckley.
Sipe, George Walter,	Carlisle,	Pa.	G. D. Keller, Ph. G.
Smith, Charles Oscar,	Hartleton,	Pa.	Dr. Muench.
Smith, Clyde Austin,	Lewisburg,	Pa.	C. B. Griffin.
Smith, Fred Harlow,	Springfield,	Mass.	H. & J. Brewer.
Smith, Gilbert Slack,	Goshen,	N. J.	Dr. A. N. Tomlin.
Smith, Henry Clay,	Millville,	N. J.	Dr. W. H. C. Smith.
Smith, Marvin Carter,	Newark,	N. J.	Chas. Henwood.
Solliday, Wm. Walter,	South Easton,	Pa.	A. Spengler.
Sombart, Joseph Louis,	Coldwater,	Kansas,	J. E. Sombart.
Sontag, George Lewis,	Neillsville,	Wis.	C. C. Sniteman, Ph. G.
Spragle, Elmer,	Bartonsville,	Pa.	G. W. Barton.
Sprissler, Clara,	Philadelphia,	Pa.	Dr. Theo. Sprissler, Ph. G.
Spruance, James Harvey,	Smyrna,	Del.	O. C. Spear, Ph. G.
Stanger, Lawrence Albertson,	Philadelphia,	Pa.	O. H. Sterner.
Stangl, Paul Louis,	Berlin,	G'rm'y.	A. Stangl, Ph. G.
Steiner, Ephraim Henry,	South Easton,	Pa.	A. N. Richards, Ph. G.
Stewart, Abraham Lincoln,	Newtown,	Pa.	J. R. Elfreth, Ph. G.
Stimmel, Walter,	Wilmington,	Del.	P. Steelman.
Stirling, David Clayton,	Philadelphia,	Pa.	J. W. Horner, Ph. G.
Stout, Oliver,	Philadelphia,	Pa.	J. L. Supplee, Ph. G.
Strohecker, Samuel Martin,	Reading,	Pa.	J. B. Raser, Ph. G.
Stroud, John Geary,	Port Providence,	Pa.	W. S. Higbee.
Sullivan, Charles Edwin,	Gettysburgh,	Pa.	J. M. Griffin.
Swainbank, Harry Harlan.	Wilkesbarre,	Pa.	Nat. Wolfe & Co.
Taggart, George Corson,	Norristown,	Pa.	A. Yeakle.
Taylor, Harry Baker,	Altoona,	Pa.	E. L. Taylor.
Thompson, Charles Leonard,	Wilmington,	Del.	J. M. Harvey.
Thompson, Wm. Franklin,	Harrisburg,	Pa.	P. W. Houck.
Thomson, Frank Frazer,	Carlisle,	Pa.	
Tinsman, John Fine,	Bloomsburg,	N. J.	A. J. Odenwelder.
Troutman, George Franklin,	Glenn Riddle,	Pa.	Dr. C. L. Lashelle, Ph. G.
Turner, Herbert Wilkinson,	Altoona,	Pa.	C. F. Randolph Ph. G.
Tyler, George Cone,	Bristol,	Pa.	Emlin Martin.
Uhler, Samuel Elliott,	Carlisle,	Pa.	J. E. Sipe.
VanDyke, Alfred Nelson,	VanDyke,	Pa.	E. V. Pechin, Ph. G.
Van Valzah, John Adams,	Camden,	N. J.	W. D. Heiser.
Venn, Joseph,	Memphis,	Tenn.	J. Goldbaum.
Visanska, Saml. A.,	Abbeville,	S. C.	Given & Co.
Wallace, Harlan Lewis,	Seaford,	Del.	W. F. Haines.
Watson, Hite,	Charlestown,	W. V.	G. T. Light.
Weiler, John Wilson.	Emaus.	Pa.	H. B. Taylor, Ph. G.
Weiss, Frederick Andrew,	Del Norte,	Col.	Weiss, Chapman Drug Co.
Welsh, Oscar Connor,	York,	Pa.	Dale, Hart & Co.
Wescott, Wm. Carter,	Atlantic City,	N. J.	E. S. Reed.
Wetzler, Geo. Washington,	Van Dyke,	Pa.	Geo. W. Ewing.
Whilt, John Henry,	Philada.,	Pa.	J. R. Landis.
Wilbert. Martin Inventius,	Utica,	N. Y.	G. W. Shingle.
Williams, Daniel Albert,	Plymouth,	Pa.	B. Armstrong.
Williams, John Henry,	Slatington,	Pa.	W. H. Reed.
Wishart, John Elmer,	Harrisonville,	Pa.	J. B. Ferguson.
Wittel, John Kaler,	Florin,	Pa.	Leidy Seipel.
Wolfenden, Benj. Franklin,	Upland,	Pa.	Wm. Procter, Jr. Co.
Woodall, Junius P.,	Smithfield,	N. C.	C. E. Spencely.
Woods, John,	Philada.,	Pa.	H. L. Woods, M. D.
Yarnall. John Winters,	Mt. Carmel,	Pa.	Geo. E. Dahis, Ph. G.
Yeager, Tilghman Wesley,	Camden,	N. J.	J. B. Moore.
Zimmerman, Robt Emil,	Neillsville,	Wis.	H. J. Youmans.
Zulick, Albert Augustus,	Schuylkill Haven,	Pa.	W. D. Reynolds, Ph. G.

SENIOR CLASS.

Name.	*Place.*	*State.*	*Preceptor.*
Amsden, Wm. Cummings,	Manchester,	Iowa.	L. Atwater & Son.
Arny, Harry Vin,	New Orleans,	La.	F. C. Godbold.
Aubley, Samuel,	Scottdale,	Pa.	J. M. McNeil.
Ayers, William Bishop,	Salisbury,	Md.	Lewis & Ward.
Barnes, Frank Albert,	Philadelphia,	Pa.	Dr. John Marshall.
Barnitz, Lincoln Gray,	Catawissa,	Pa.	G. W. Roland, Ph. G.
Barrett, Charles L.,	Chester Co.,	Pa.	D. S. Jones, Ph. G.
Bateman, Wm. Henry Stevens,	Mahanoy City,	Pa.	T. J. Lightcapp, Ph. G.
Baur, Jr., William Christopher,	St. Clair,	Pa.	S. E. Walker.
Bender, John Jacob,	Shippensburg,	Pa.	S. S. Loughead.
Benerman, Alan Herbert,	Philadelphia,	Pa.	H. C. Bl ir's Sons.
Bennum, Charles Henry,	Georgetown,	Del.	H. Swaim, Ph. G.
Bentley, David Fuller,	Philadelphia,	Pa.	R. Shoemaker & Co.
Berkemeyer, Francis Molton,	Kutztown,	Pa.	H. Duffield, M.D.
Berkstresser, Watson J.,	Huntingdon,	Pa.	J. H. Black & Co.
Bickel, Harry Lee,	Felton,	Del.	F. E. Morgan.
Bilheimer, John Jessiah,	Bath,	Pa.	Dr. G. P. Kern & Co.
Birch, Harry Rees,	Philadelphia,	Pa.	Bullock & Crenshaw.
Boger, Charles Everett,	Lebanon,	Pa.	George W. School.
Bowers, Charles Edward,	Middletown,	Pa.	A. Robbins, Ph. G.
Bowman, David Buchanan,	Lancaster,	Pa.	W. G. Baker, Ph. G.
Boyer, Allen Webster,	Allentown,	Pa.	W. E Moyer, Ph. G.
Bradley, Augustus,	Tarboro,	N. C.	W. H. McNair, Ph. G.
Brick Harry Walter,	Fitchburg,	Mass.	Bullock & Crenshaw.
Bright, William Willits,	Muncy,	Pa.	J. R. Smyser, Ph. G.
Brown, Barton Levi,	Pleasant Grove,	Pa.	J. Harry Love, Ph. G.
Brown, Walter Lee,	Camden,	N. J.	A. P. Brown, Ph. G.
Buchanan, Frank,	Crum Lynne,	Pa.	C. H. Roberts,
Burget, Harry Edward,	Terre Haute,	Ind.	W. C. Buntin.
Burnett, James Howard,	Hackensack,	N. J.	L. B. Hirst.
Butt, Simon Mark,	Gettysburg,	Ohio,	L. E Sayre, Ph. G.
Butters, Charles Hayes,	Titusville,	Pa.	T. W. Reuing, Ph. G.
Butterworth, Frank James,	Lenni,	Pa.	C. L. Lashelle, M. D.
Cahill, Frank Joseph,	Trenton,	N. J.	J. E. Cahill.
Caldwell, Florence Moore,	Jenkintown.	Pa.	S. W. Caldwell, M. D.
Campbell, Clarence Henry,	Easton,	Md.	M. Campbell, Ph.G.
Carman, Frank Hamilton,	Pennsgrove,	N. J.	Dr. M. Johnson.
Carritte, Clarence Edgar,	St. Paul,	Minn.	J. P. Carritte.
Cartwright, Benj. Franklin,	Philada.,	Pa.	Dr. Wm. Delker.
Cassaday, Frank Valorus,	Alliance,	Ohio,	A. S. Cassaday.
Cassidy, John Francis,	Philada.,	Pa.	W. H. Pile & Son.
Castle, Abraham Lincoln,	Upland,	Pa.	J. J. Parker.
Christ, Franz,	Philada.,	Pa.	W. J. Wilkinson, Ph. G.
Clabaugh, Edgar M.,	Altoona,	Pa.	D. G. Hurley, Ph. G.
Clapham, Benson Grant,	Mifflinburg,	Pa.	H. C. Clapham, Ph. G.
Clarke, E. Edwin,	Bradford,	Pa.	Thompson & Wood.
Clavin, James,	San Antonio,	Texas,	W. R. Clavin.
Cline. John Halliday,	Middleport,	Ohio,	E. Davis & Co.
Cochran, Levi Bennett,	Oneida Castle,	N. Y.	J. H. Cool.
Codville, Wm. Lowther,	Philada.,	Pa.	C. G. A. Loder, Ph. G.
Codville, Henry Lawson,	Philada .,	Pa.,	W. O. Higgate, M. D.
Collings, Walter,	Gloucester,	N. J.	D. W. Flemming.
Cope, Frank Henry,	Philada.,	Pa.	J. M. Higgins.
Cooper, Percival Valentine,	Media,	Pa.	M. W. Dickeson.
Cottam, Charles Marquis,	Beaver Falls,	Pa.	J. Fajans, M. D.
Cotton, Frank Wilbert,	Bordentown,	N. J.	G. M. Carslake.
Courson, Harry Stockton,	Williamsport,	Pa.	Duble & Cornell.

Name.	Place.	State.	Preceptor.
Craig, George Tindall,	Wilmington,	Del.	Z. Jas. Belt.
Crane, William Howard,	Philada.,	Pa.	A. R. Finck, M. D.
Crawford, Archie Darrah,	Norristown,	Pa.	Wm. Stahler.
Crawford, Jr., Walter Beatty,	Chambersburg,	Pa.	Thos. L. Buckman, Ph. G.
Daniels, Wm. Joseph,	Pueblo,	Col.	A. C. Daniels, Ph. G.
Darling, Dwight Kellum,	Salt Lake City,	Utah.	D. Turngien.
Davis, Edward,	Coal Dale,	Pa.	D. R. Davis.
Davis, Pierre Beaumont,	Gainesville,	Texas.	H. O. Cravens, Ph. G.
Davison, J. C.,	Washington,	D. C.,	A. D. Cuskaden, Ph.G.
Day, Frederick Samuel,	Philada.,	Pa.	Warrington & Pennypacker.
Deitz, George Arthur,	Chambersburg,	Pa.	W. L. Cliffe, Ph. G.
DeLaCour, Joseph Carl,	Camden,	N. J.	J. C. DeLaCour.
Dietz, Jr., Charles James,	Philada.,	Pa.	Dr. Wm. Delker.
Dorman, William Albert,	Hartleton,	Pa.	M. L. Muench, M. D.
DuBois, Samuel Conier,	Philada.,	Pa.	J. R. Elfreth, Ph. G.
Eagle, Edward Worrell,	New Castle,	Del.	J. J. Black, M. D.
Edenborn, Chas. Wesley Simons,	Philada.,	Pa.	Dr. Bauer.
Eft, Frederick,	Palatine,	N. J.	Dr. C. G. Frowert.
Eldredge, Clarence Selby,	Cape May,	N. J.	Drs. Marcy & Mecray.
Engelman, Henry Shaffer,	Cherryville,	Pa.	Weaver & Hohl.
Enders, William James,	Harrisburg,	Pa.	F. Rapp, Ph. G.
Ensminger, Saml. Chas. Deeg,	Manheim,	Pa.	A. F. Gerhard, Ph. G.
Faries, Joseph Benjamin,	Smyrna,	Del.	S. P. Wright, Ph. G.
Fehr, George W.,	Landingville,	Pa.	Albert Cable.
Field, Claud,	Indianapolis,	Ind.	F. H. Carter.
Fiet, Harvey Jacob,	Philada.,	Pa.	P. G. A. Weber.
Finkeni, William Caspar,	Camden,	N. J.	D. G. W. Henry.
Foulkes, Stephen Harvey,	Terre Haute,	Ind.	J. F. Gulick.
Gabell, Cromwell Pearce,	Florence,	N. J.	
Ganster, William Foster,	Reading,	Pa.	F. X. Wolf.
Geist, Richard Clement,	Medford,	N. J.	H. P. Thorn.
Gillispie, Henry Robert,	Reserve,	Kas.	J. M. Cecil, M. D.
Glenk, Robert,	Philada.,	Pa.	Julius Israel.
Goll, Philip,	Wildensee,	Germany,	Wm. J. Shaeffer.
Gould, Henry Zinn,	Carlisle,	Pa.	White & Bro.
Gracey, Archibald Gracey,	Philada.,	Pa.	W. B. Banks, Ph. G.
Greenfield, Lewis Thompson,	Carlisle,	Pa.	H. C. Blair's Sons.
Greenfield, Oliver Roat,	Philada.,	Pa.	Dr. Krause.
Griffin, Howard Ezra,	Scranton,	Pa.	Chas. Henwood.
Groom, Joseph,	Philada.	Pa.	Hance Bros. & White.
Guthrie, DeWitt Clinton,	Wilkesbarre,	Pa.	W. D. White.
Hackney, George Wyly,	Uniontown,	Pa.	H. S. Clark.
Hall, Marlborough,	Philada.	Pa.	H. C. Blair's Sons.
Hallowell, Bruce Clyde,	Frankford,	Pa.	G. S. R. Wright.
Hance, Jr., Edward Hance,	Philada.,	Pa.	Hance Bros. & White.
Handler, William,	Cleveland,	Ohio.	H. Mueller, M. D.
Harpel, Luther Grant,	Lebanon,	Pa.	J. T. Shinn, Ph. G.
Hatcher, Robert Anthony,	New Orleans,	La.	J. L. Lyons & Co.
Haupt, William Grant,	Hartleton,	Pa.	M. L. Muench.
Hausmann, Fred. William,	Philada.,	Pa.	Chris Weiss.
Heiges, William Smith,	York,	Pa.	Wm. Smith & Co.
Hertel, Fred. Gustave,	Nashville,	Ills.	Wm. Gruhs.
Hinkson, Wm. Elwood,	Chester,	Pa.	Chas. E. Davis.
Hoffecker, Robt. Crockett,	Dover,	Del.	T. C. Tomlinson, M.D.
Hoffman, Erdman,	Leipsic,	Del.	J. M. Wert, M. D.
Hostetter, Andrew Grider,	Florin,	Pa.	Corwin Mullock.
Houghton, John Almer,	Salt Lake City,	Utah.	J. F. Allen.
Howard, Mrs. C. E.,	Philada.,	Pa.	H. B. Snavely, Ph. G.
Howell, Samuel Emerson,	Camden,	Del.	C. E. Downes.
Hughes, Frank Stacker,	Norristown,	Pa.	J. G. Wells, Ph. G.

Name.	*Place.*	*State.*	*Preceptor.*
Hume, Ward Dutcher,	Minneapolis,	Minn.	R. McNeil.
Humma. Henry John,	Reading,	Pa.	H. M. Muhlenberg, Ph. G.
Jacob, Charles Pim,	West Grove,	Pa.	F. Jacoby, Jr.
Jacobs, Oliver Barron,	Bridgeville,	Del.	R. W. Cannon.
James, Henry Hughes,	Wyoming,	Pa.	E. Wilson
Johnson, Frank R.,	Chester,	Pa.	G. Banks Wilson.
Jones, Will Lincoln,	Catasauqua,	Pa.	Wm. Heckenberger.
Judge, John Aloysius,	Philada.,	Pa.	Bullock & Crenshaw.
Jump, Henry Draper,	Dover,	Del.	Dr. S. D. Marshall.
Kappes, Jacob J.,	Zanesville,	Ohio.	Hatton Brothers.
Kantner, Harry Baker,	Altoona,	Pa.	D. W. Levy.
Keller, Augustus Herman,	Philadelphia,	Pa.	A. G. Keller, Ph. G.
Kelly, John P.,	Elmira,	N. Y.	A. H. Baker, M. D.
Kendig, Allen Jesse,	Philadelphia,	Pa.	R. P. Marshall.
Kennedy, Alfred Dennis,	Philadelphia,	Pa.	A. Nebeker, M. D.
Kennedy, Harry Milton,	Cape May,	N. J.	Dr. Kennedy.
Kern, Franklin,	Slatington,	Pa.	S. Everett Betts, Ph. G.
Kiger, Harry Stiles,	Wilmington,	Del.	H. C. Snitcher, M. D.
Kilgus, John Frank,	Renovo,	Pa.	M. L. Clay.
Kilgus, William Michael,	Renovo,	Pa.	E T Swain.
Kingston, Charlie Davis,	Granby,	Mo.	Powers & Benton.
Kleinstuber, William George,	Wilmington,	Del.	E. Hertel, M. D.
Klopp. Henry Leinbach,	West Leesport,	Pa.	S. H. Shingle, Ph.G.
Klopp, Peter Paul,	N. Heidelsburg,	Pa.	J. A. Gingrich.
Knowles, George Alexander,	Philadelphia,	Pa.	W. D. Kerr.
Kraemer, Henry,	Philadelphia,	Pa.	C. B. Lowe & Co.
Krauss, Gustav Adolf,*	Bremen,	Germ'y	Wm. Proctor, Jr. Co.
Krider, Richard C.,	Philadelphia,	Pa.	Stryker & Ogden.
Lammer, Henry Bruno,	Philadelphia,	Pa.	Bullock & Crenshaw.
Latin, Adolph,	Dayton,	Ohio.	George Latin, Ph. G.
Lehman, Charles,	Highland,	Ill.	Edmund Knoebel.
Leine, Arthur Morris,	Honesdale,	Pa.	N. G. Ritter, Ph. G.
Leitch, Charles Thomas,	Quakertown,	Pa.	
*Lesher, Edwin Charles,	Kutztown,	Pa.	M A. Hull, Ph. G.
Lesher, John Becker,	Shoemakerville,	Pa.	E. W. Sharp.
Lewis, Griffith Robert,	Catasauqua,	Pa.	E D Boyer, Ph.G.
Livingood, Albert John,	Reading,	Pa.	J. B. Raser, Ph.G.
Lowenberg, Joseph,	Bloomsburg,	Pa.	N. J. Hendershott.
Lowry, Sidney Allen,	Yorkville,	S. C.	May & May.
Macartney, Frank Hamilton,	Berwick,	Pa.	Grove & Kisner.
McCloskey, Chas. Edw'd Reese,	Knoxville,	Pa.	E. C. Warg, Ph. G.
McCouch, John Wanamaker,	Philadelphia,	Pa.	H. E. Ashmead.
McFadden, Robert,	Philadelphia,	Pa.	L. F. Segrest, Ph. G.
McIntosh, John R.,	Galion,	Ohio.	B. N. Bethel, M. D.
Mack, John Sandford,	Slatington,	Pa.	J. E. Williams.
McKee, Joseph Allen,	Altoona,	Pa.	Alton Clabaugh, Ph.G.
McKeel, Charles Baynor,	Washington,	N. C.	John McDonald, M.D.
McKnight, J. Irwin,	Pittsburg,	Pa.	H. G. Peters.
McLarty, Eugene,	Tradersville,	S. C.	C. D. Passapae.
McMechen. Wm. Benjamin,	Wheeling,	W. Va.	J. J. Ottinger, Ph. G.
McMillan, John C.,	Latrobe,	Pa.	W. A Fetters, Ph. G.
McNair, Edward Dudley,	Tarboro,	N. C.	L. C. Funk, Ph. G.
McNeil, Robert Carson,	Philadelphia,	Pa.	R. McNeil.
Macon, Gideon Hunt,	Warrenton,	N. C.	F. P. Hunter.
Macpherson, Frank Street,	Camden,	N. J.	L. H. Street.
Mayers, Henry John,	Wheeling,	W. Va.	
Meredith, Charles Clyde,	Palatine,	W. Va.	Dr. A. W. Taylor,
Merkel, William,	Minersville,	Pa.	Dr. J. M. Bradford,
Miles, Chas. John Austin,	Manchester,	N. J.	R. W. Cuthbert, Ph.G.
Miller, Charles Bodine,	Goldsboro,	N. C.	F. E. Morgan, Ph. G.

Name.	*Place.*	*State.*	*Preceptor.*
Miller, Solomon,	Hagerstown,	Md.	H. Knight, Ph. G.
Minner, Louis Augustus,	St. Louis,	Mo.	Thos. Knœbel.
Mittelbach, Henry,	Boonville,	Mo.	Wm. Mittelbach.
Moffet, John,	Philada.,	Pa.	J. Moffet.
Mohn, John Ellsworth,	Penn's Creek,	Pa.	J. W. Sampsell, M. D.
Möller, John Daniel,	Philada.,	Pa.	Dr. Lamparter.
Moody, Willie Bossieux,	Richmond,	Va.	W. L. Moody.
Moor, Jr., Edward,	Media,	Pa.	S. E. R. Hassinger, Ph. G.
Morgan, George Irving,	Lynn,	Mass.	F. E. Morgan, Ph. G.
Morris, Joseph Garrison,	Seaville,	N. J.	E. W. Sharp.
Moss, William,	Akron,	Ohio.	H. H. Ross.
Moyer, Reuben Emanuel,	Robesonia,	Pa.	H. D. Huntsman, Ph. G.
Murray, Emmett Leroy,	Americus,	Ga.	H. K. Mulford, Ph. G.
Murray, James Joseph,	Reading,	Pa.	J. A. Stein, Ph. G.
Murray, Robert William,	Harrisburg,	Pa.	A. W. Numemacher.
Musgrave, Aaron Wallace,	Bloomsburg,	Pa.	L. E. Sayer, Ph. G.
Myers, Carvosso Oursler,	Centralia,	Kas.	Dr. A. J. Best.
Myers, Frank,	Harrisonburg,	Va.	F. A. Lewis.
Nardyz, Emma Bour,	Philada.,	Pa.	S. Hayhurst, M. D.
Nichols, John Baugh,	Philada.,	Pa.	W. R. Warner & Co.
Ogden, Chas. Sheppard,	Camden,	N. J.	U. F. Richards.
Osmun, Milton Mackey,	Delaware,	N. J.	W. S. Freeman.
Owens, Harold Duche,	Philada.,	Pa.	D. Marshall & Bro.
Owing, Osmund Young,	Winnsboro,	S. C.	Chas. Shivers.
Palmer, Chas. W.,	Frenchtown,	N. J.	J. B. Cooke.
Perrenot, Emile Alfonso,	New York,	N. Y.	T. M. Galbraith, Ph. G.
Pfeiffer, Charles Alfred,	Baltimore,	Md.	J. H. Evans, Ph. G.
Pickett, Charles Torbert,	New Hope,	Pa.	H. C. Blair's Sons.
Pierce, Wm. Abner,	West Chester,	Pa.	T. G. Pierce.
Pollock, Jr., Robert Blair,	Philada.,	Pa.	R. Pollock.
Porter, Crawford Washington,	Philada,	Pa.	Jas. T. Shinn, Ph. G.
Porter, M. Arthur,	Canton,	Pa.	Mix & Whitman.
Potts, George Clinton,	Harrisburg,	Pa.	Dr. W. M. L. Weills.
Quackenbush, Fred. Briggs,	Penn Yan,	N. Y.	W. W. Quackenbush.
Ramsey, Charles Carroll,	Floyd,	Iowa,	Dr. Ellis.
Ranftle, Oscar,	Long Island,	N. Y.	W. E. Lee, Ph. G.
Ray, George Herbert,	Portland,	Oregon,	Plummer & Byerley.
Raynor, Howard Lincoln,	Norristown,	Pa.	R. Shoemaker & Co.
Read, Ralph Maynard,	Osceola Mills,	Pa.	F. B. Read, M. D.
Reading, Joel Salter,	Lambertville,	N. J.	G. P. Scheeble, Ph. G.
Redner, Thaddeus Rowland,	Philada.,	Pa.	Kennedy & Burke.
Reider, Edwin Stanton,	Williamsport,	Pa.	Duble & Cornell.
Reig, Eugene George,	Warren,	Pa.	L. G. Noyes.
Reith, Emil,	Philada.,	Pa.	T. A. Walker, Ph. G.
Reynolds, May,	Philada.,	Pa.	A. M. Reynolds, M.D.
Rhoads, Harry Paist,	Doylestown,	Pa.	Dr. T. E. Conard.
Richards, Davis Bruce,	Philada.,	Pa.	Wm. Weber.
Richter, Gustave Adolph,	Philada.,	Pa.	J. D. Groves, M.D. Ph. G.
Ridgway, Charles Alexander,	Hydetown,	Pa.	J. H. Kerr, Ph. G.
Rishell, John Dauberman,	Bellefonte,	Pa.	John Harris.
Risley, Leon Stewart,	Manchester,	Conn.	W. A. Lowry.
Rogers, William Black,	Jefferson,	Pa.	Blachly & Rogers.
Rolleston, Arthur Raymond,	Philada.,	Pa.	Harry Cox, Ph. G.
Rosenkrans, Cyrill Depue,	Fairdale,	Pa.	Geo. B. Evans, Ph. G.
Ross, William M.,	Richmond,	Ind.	W. H. Ross.
Roth, Saml. Geo. Jeremiah,	Laury's,	Pa.	A. B. Wenrich, Ph. G,
Rudy, Jacob Albert,	York,	Pa.	C. B. Lowe, Ph. G., M. D.
Rutherford, Frank Park,	Cochranville,	Pa.	Hnmes Hall, Ph. G.
Schetky, Laurence Oliphant,	Mt. Holly,	N. J.	Bullock & Crenshaw.
Schleif, Wm.,	Milwaukee,	Wis.	Aschenbach & Miller.

Name.	*Place.*	*State.*	*Preceptor.*
Schloer, Chas. Albert,	York,	Pa.	Dr. C. S. Burland.
Schminky, Allen Beecher,	Lykens,	Pa.	A. G. Stanley.
Schultze, Henry John,	Cincinnati,	Ohio.	Edmund Backhaus, Ph. G.
Schutzenbach, Augustus,	Harrisburg,	Pa.	F. P. Albright, Ph. G.
Schwab, Leslie Watts,	Decatur,	Ill.	A. J. Blaine.
Schwacke, Charles Albert,	Charleston,	S. C.	A. H. Schwacke.
Schwenk, Wm. Henry,	Peoria,	Ill.	R. D. McDougal.
Shaw, Harry Burfield,	Philada.,	Pa.	A. S. Lamb.
Sherman, Joseph Bennett,	Bristol,	Pa.	J. K. Young.
Small, John Hamilton,	York,	Pa.	H. C. Blair's Sons.
Smedley, Albert Webster,	Chester,	Pa.	L. B. Hirst, Ph. G.
Smith, Frederick William,	Loudonville,	Ohio.	Geo. Holland, M. D.
Smith, John Stewart,	Lexington,	Ky.	J. A. Flexner.
Snyder, Howard Grant,	Lancaster,	Pa.	W. T. Baker, Ph. G.
Southall, Charles Morton,	Clarksville,	Tenn.	Owen & Moore.
Southerland, Thomas Raibe,	Wilmington,	N. C.	J. H. Hardin.
Stephen, Willie Leisse,	Reading,	Pa.	J. B. Raser, Ph. G.
Steltzer, Nathan Samuel,	Philadelphia,	Pa.	John A. Martin, Ph. G.
Stewart, Aaron Walter,	Philadelphia,	Pa.	J. R. Elfreth, Ph. G.
Stevens, Fred Madison,	Auburn,	Me.	T. J. Stevens.
Stoever, Harry Van Hoff,	Chester,	Pa.	J. M. Stoever, Ph. G.
Strunk, Lewis Curtin,	Quakertown,	Pa.	W. M. Bowen.
Thompson, Ebenezer Francis,	Titusville,	Pa.	E. K. Thompson.
Thompson, Herbert Moodie,	Thompsontown,	Pa.	Bullock & Crenshaw.
Thornton, Edward Quin,	Greensboro,	Ala.	A. Stollenweber & Son.
Trauck, Charles Cowdrick,	Tinicum,	Pa.	William Hummell,
Tyler Thomas Van Dyke,	Altoona,	Pa.	H. S. Bartlett.
Upham, Samuel W.	Bath,	N. Y.	A. Kasson, M. D.
Vandegrift, Wm. H'y. Flitcraft,	Philadelphia,	Pa.	Wm. Reisert, Ph. G.
Van Dyke, Wm. Clinton,	Van Dyke,	Pa.	R. P. Marshall.
Wagaman, Samuel Edward,	Chambersburg,	Pa.	J. S. Nixson & Son.
Wallis, J. Frank,	Philadelphia,	Pa.	Dr J. M. Wallis.
Ward. Percy Hall,	Crisfield,	Md.	Hall & Atkinson.
Warren, Nathan Chew,	Upland,	Pa.	C. L. Lashelle, M. D.
Watkins. Edmund Howell,	Girardville,	Pa.	G. W. Storie,
Weaber, Charles Henry,	Fredericksburg,	Pa.	Dr. T. M Reeder.
Weber, Wm.,	Philadelphia,	Pa.	R. J. Weber.
Weil, Joseph L.,	Reading,	Pa.	J. C. Sanderson,
Weiser, Walter Rupert,	York,	Pa.	D. F. Shull & Co.
Wells, Fred Barton,	Vineland,	N. J.	Dr. S. W. Gadd.
Westphal, Herman,	Hamburg,	Germ'y.	F. J. Koch.
White, E. Riall.	Salisbury,	Md.	Bullock & Crenshaw.
Williams, Solomon Cohen,	Charleston,	S. C.	Genois & Laubach.
Williamson, James Strickler,	Harrisburg,	Pa.	Dr. Theo. Jacobs.
Wischman, Joseph Washington,	Philadelphia,	Pa.	Louis Trupp.
Wishart, Frederick Gray,	Philadelphia,	Pa.	F. E. Harrison. Ph. G.
Witherow, John Howard,	Shippensburg,	Pa.	J. C. Altick & Co.
Witmer, Albert Elam Ferre,	Philadelphia,	Pa.	D. L. Witmer & Bro.
Woertz, George Augustus,	Philadelphia,	Pa.	C. E. Hewitt, Ph. G.
Wolf Frederick Joseph,	Philadelphia,	Pa.	R. Shoemaker & Co.
Wood, Harry Sudduth,	Maysville,	Ky.	G. T. Wood.
Woodruff, John Stewart,	Bridgeton,	N. J.	J. L. Curry.
Worrall, Harry,	Wilmington,	Del.	N. B. Danforth, Ph. G.
Wright, John Armstrong,	Philadelphia,	Pa.	A W. Wright & Co.
Wright, Walter,	Camden,	N. J.	Dr. C. G. Hoell.
Young. Charles,	Johnstown,	Pa.	T. H. Potts, Ph. G.
Yohn, Francis Jerold,	Pottstown,	Pa.	T. J. Hoskinson, Ph. G.
Ziegler, Roger William,	York,	Pa.	S. M. Gable.
Zinnel, Wm. Corson,	Philadelphia,	Pa.	H. L. Barber, Ph. G.